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An Expert System for Processing Uncorrelated Satellite Tracks

by

Michael A. Hecker
Lieutenant Commander, United States Navy
B.S., United States Naval Academy

Submitted in partial fulfillment
of the requirements for the degree of

MASTER OF SCIENCE IN COMPUTER SCIENCE
MASTER OF SCIENCE IN AEROSPACE ENGINEERING

ABSTRACT

Through an array of ground based radar sights and optical cameras, the United States military tracks objects in near and far Earth orbit. The sensors provide epoch and ephemeris information that is used to update a database of known objects. While a majority of the sensor observations are matched to their corresponding satellites, a small percentage are beyond the capabilities of current software and can not be correlated. These uncorrelated targets, UCT's, must be manually fitted by orbital analysts in a labor intensive process. As an alternative to this human intervention, the use of artificial intelligence techniques to augment the present computer code was explored. Specifically, an expert system for processing UCT's at the Naval Space Surveillance Command was developed. Rules were generated through traditional knowledge engineering methods and by a novel application of machine learning. The initial results are very good with the operational portions of the system matching the performance of the experts with an accuracy of 99%. Although not yet complete, the code developed in this research definitely shows the potential of using artificial intelligence to process UCT's.

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I. INTRODUCTION

Currently, over 7000 objects circling the Earth are tracked by both the Air Force and the Navy. The orbital information on each object is maintained in a database that is used by the military and civilian communities for various purposes; cataloguing space debris, warning of close encounters between commercial satellites, and deconflicting the launch of the space shuttle are a few examples. Utilizing an array of sensors, monitoring is performed on a continuous basis. The sensors, which include both ground based radar sights and optical cameras, produce epoch and ephemeris information that is used to update the orbital catalog of known satellites. Of the 1.4 million observations produced each month, 98.5% can be automatically matched to objects in the orbital catalog by current software. The remainder, called Uncorrelated Targets (UCT), must be manually fitted to the database in a labor intensive procedure that requires human intervention for approximately 21,000 observations per month. The effort consumes one to two thousand manhours a year and, from the launching of new satellites and the break up of those already in orbit, the work load is growing with the increasing population of objects in Earth orbit. (Naval Space Surveillance Command, 1990, p. 7)

Several methods are being explored to reduce the work load imposed by UCTs. One obvious solution is to employ a computational model that more accurately accounts for orbital perturbations and does an improved job of predicting an object's motion. An alternate possibility is to use heuristic or non-numerical methods in software that simulate the solution techniques already being used by human analysts for manual updates. Utilizing tools developed in the field of artificial intelligence, the human operator could be potentially replaced by an expert system.

The purpose of this thesis is to explore the feasibility of using such an expert system to process UCT's. Specifically, the idea of implementing a knowledge-based system at the Naval Space Surveillance Center (NAVSPASUR) will be examined. The architecture of the system will be presented along with an initial code that could form the basis for an implementation. Finally, the feasibility and limitations of the expert system approach will be discussed.

II. BACKGROUND

A. ORBITAL MODEL

NAVSPASUR uses the Brouwer-Lyddane theory of orbital motion. This model has a substantial advantage over Kepler's in that it accounts for a non-spherical Earth and the associated anisotropic gravitational field. In addition, a NAVSPASUR modification eliminates a singularity and allows for a simplistic representation of the atmospheric drag. Accuracies of several hundred meters are typical when predicting satellite positions with this algorithm. (Naval Research Laboratory, 1991)

The original Brouwer theory is based on a propagation algorithm that can be used to predict the future position of a satellite. The gravitational potential of Earth is expressed as a set of spherical harmonics and solved using a series solution:

$$U=\frac{\mu}{r}-\frac{\mu}{r}\sum_{n=1}^{\infty}\frac{R_E{}^n}{r^n}J_n\ P_n\ \sin\beta$$

where
μ = Earth's gravitational constant
r = Distance of the satellite from the Earth's center
R_E = Radius of Earth
J_n = Coefficient dependent on Earth's mass distribution
P_n = Legendre polynomials
β = Geodetic latitude

This contrasts with Kepler's simpler representation which assumes all the J_n-factors are zero and truncates the series after one term. Brouwer's model results in both the satellite's position and the actual orbital elements varying with time. The equations of motion for this dynamic system have been solved using Hamilton-Jacobi theory. (Brouwer, 1959)

The Lyddane modification to Brouwer's model accounts for singularities that occur in circular orbits (Lyddane, 1963). The NAVSPASUR modification accounts for singularities that occur as inclination approaches 63.4°. It also includes a term for atmospheric drag based on a spherical atmosphere with density varying exponentially with height

$$\rho(r)=\rho_0 e^{-\frac{r-r_0}{H}}$$

where
r = altitude above the surface of Earth
r_0 = Reference altitude
ρ_0 = Density at reference altitude
H = Scale height

The actual code for the orbital prediction routine is written in the fortran program PPT2.

B. SENSOR DATA

Various sensors are maintained by the Navy, Air Force, and NASA for sighting satellites. Based on radar or optical cameras, they provide the position of the satellite relative to the observer. Using transformation matrices, these observations are converted into parameters in the geocentric inertial coordinate system such as right ascension and declination. The sensors are "intelligent" in that they provide not only a right ascension, declination, height, and time of observation (epoch), but also a best guess as to what satellite was observed. These are called *known observations*. If the sensor can not come up with a best guess, then an *unknown observation* is generated. Groups of observations of the same satellite from the same sensor form a *track*. (Naval Space Surveillance Command, 1990, pp. 1-2)

C. DATAFLOW AT NAVSPASUR

1. Orbital Catalog

The primary database of objects circling the Earth is the orbital catalog. In addition to the orbital elements, it holds a list of the last 75 sensor observations attributed to each item in the catalog. A sample set of orbital elements is shown in Table I.

2. Real Time Operations

NAVSPASUR is the Navy command tasked with tracking, cataloging, and predicting satellite orbits. To support this effort, a suite of computers and fortran

TABLE I. ELEMENT SET

PARAMETER	UNITS	VALUE
INTERNATIONAL DESIGNATION	N/A	88 098 C
CATALOG NUMBER	N/A	20132
DECLINATION	DEGREES	4.07
PERIOD	MINUTES	440.34
RIGHT ASCENSION	DEGREES	333.63
DECAY RATE	MIN/DAY	-0.1590
ECCENTRICITY	N/A	0.00
EPOCH OF THE ELEMENT SET	YYMMDD	911222

software is used. A simplified version of the data processing that takes place is shown in Figure 1. Incoming observations from sensors are stored in a holding file. Every 15 minutes, the known observations are processed by a computer program called SATO. Using the PPT2 algorithm and a least squares fit on each observation, SATO validates the sensor's best guess and, if it is within parameters, uses the observation to update the current orbital element set in the database. Unknown observations are not processed on a real time basis. (Naval Space Surveillance Command, 1990, pp. 3-9)

3. Off Line Operations

Unknown observations and observations rejected by SATO are written to a second holding file. Daily, the program VERIFY examines this file and performs an exhaustive attempt to fit the unknown/rejected observations to the database. Tolerances in VERIFY are no different than those for SATO, consequently tracks that were not accepted by the real time computations will be subsequently rejected by the off line program. However, VERIFY will attempt to fit rejected observations to other satellites and will process unknown observations.

Tracks which still do not fit are run through a third program called SID (Satellite Identification program) which simply fits every observation to every possible satellite that can accommodate the observations and prints out a report of the results. Tolerances for SID are lenient so the printout it produces usually contains a few thousand entries. An example portion of that printout follows:

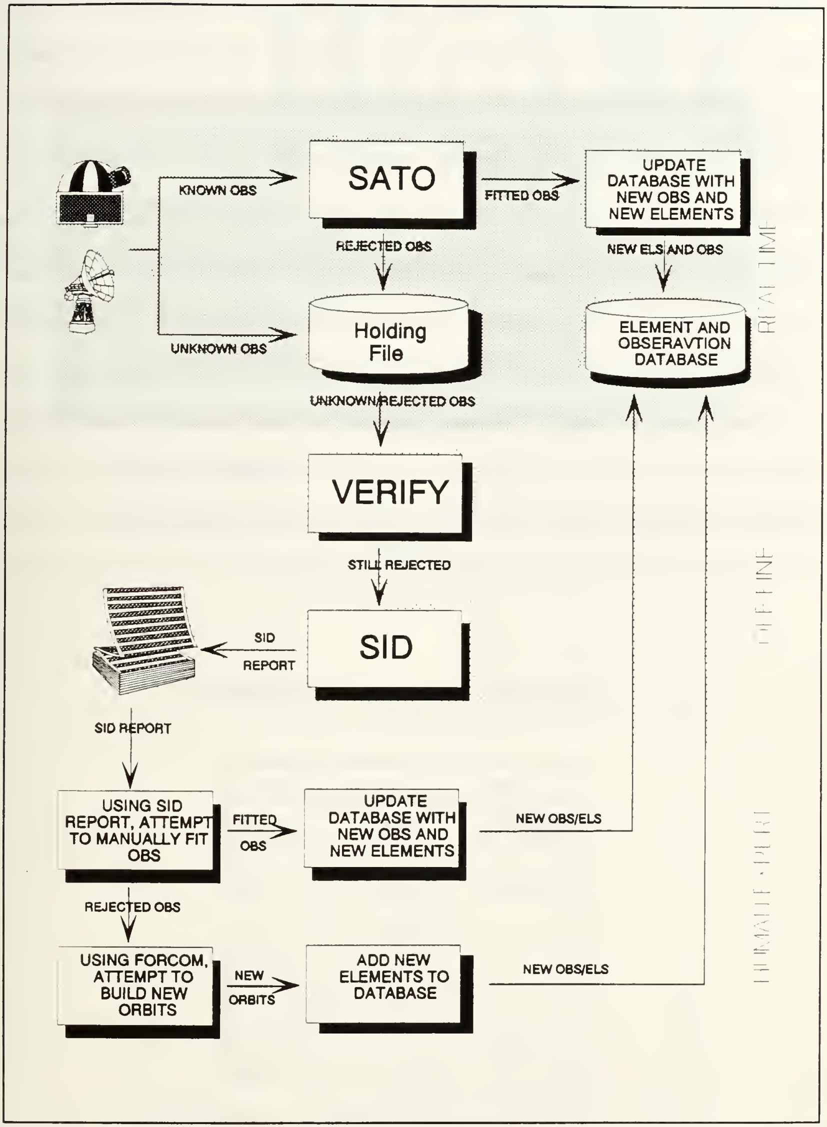

SATO
KNOWN OBS
FITTED OBS
UPDATE DATABASE WITH NEW OBS AND NEW ELEMENTS
REJECTED OBS
NEW ELS AND OBS
UNKNOWN OBS
Holding File
ELEMENT AND OBSERAVTION DATABASE
REAL TIME
UNKNOWN/REJECTED OBS
VERIFY
STILL REJECTED
OFF-LINE
SID
SID REPORT
SID REPORT
USING SID REPORT, ATTEMPT TO MANUALLY FIT OBS
FITTED OBS
UPDATE DATABASE WITH NEW OBS AND NEW ELEMENTS
NEW OBS/ELS
HUMAN - ALERT
REJECTED OBS
USING FORCOM, ATTEMPT TO BUILD NEW ORBITS
NEW ORBITS
ADD NEW ELEMENTS TO DATABASE
NEW OBS/ELS

Figure 1. NAVSPASUR Data Flow

```
20132  4.07         440.34   -.1590    88 098 C    333.63   911222
       911222  000549.46   1129     -6     -1     -8   90335    382
       911222  000559.50   1148     -6     -0     -8   90335    382
       911222  000609.65   1168     -6     -1     -7   90335    382
       911222  000629.74   1207     -5     -2     -6   90335    382
       921223  232910.67   1329     10     10     29   20132    334
       921223  233020.64   1301     21     15    312   20132    334

20150  82.94        104.74   -.0000    89 059 B    155.98   911223
       912221  101547.90    507    160   1063     -9   90452    385
```

The first line lists the satellite that the program is currently matching to the observations. From left to right, the data fields are the NAVSPASUR catalog number, the inclination, the period, the decay rate, the international designation for the satellite, the right ascension angle, and the epoch of the element set. Units for each field were previously given in Table I. Following the satellite data is one or more lines of observation data with units and sample values shown in Table II. The epoch, both date and time, is provided along with the measured altitude of the observed object. The next

TABLE II. OBSERVATION DATA FROM SID

PARAMETER	UNITS	VALUE
EPOCH OF OBSERVATION	YYMMDD HHMMSS.HH	911222 000549.26
ALTITUDE	NM	1129
ΔU	N/A	-6
ΔV	N/A	-1
ΔW	N/A	-8
SENSOR TAG	N/A	90335
SENSOR	N/A	382

three columns are the cartesian errors that resulted in attempting to fit this particular observation to the satellite's current orbit. The NAVSPASUR programs utilize a least mean square algorithm for curve fitting and the resulting errors are presented in the orbital reference frame as shown in Figure 2. Consequently, the columns give the ΔU, ΔV, and ΔW for the particular observation. The numbers listed are not actual distances, rather they are based on the partial derivatives of the observation with respect to the satellite's element set. As such they have no units.

The final two columns in the rows of observation data are the sensor tag, i.e., the sensor's original best guess, and the sensor's identification number.

4. Manual Operations

With the production of the SID report, computer processing of UCTs ends and human intervention is necessary. Daily, an orbital analyst examines the SID report

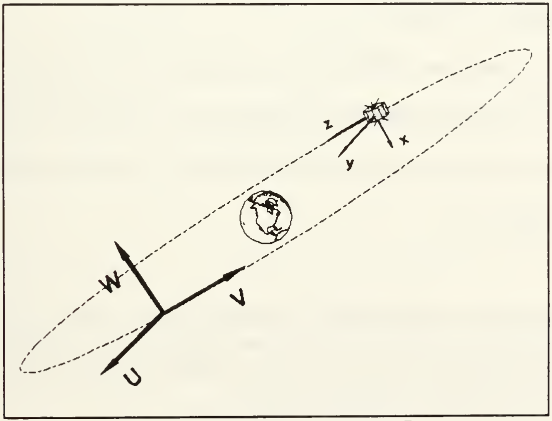


Figure 2. U, V, W REFERENCE FRAME

line by line, looking for tracks that can be added back into the database. Evaluation centers on the ΔU, ΔV, ΔW values and corroborating data fields that might explain the magnitude of the errors. If a potentially good track is found, an attempt is made to fit it into the desired orbit using an iterative technique. The new observations are combined with selected old observations to build a new set of orbital elements that can more accurately portray the satellite's motion. Again, a least squares fit is used, with various observations being added and subtracted until a suitable orbit is achieved. Observations that ultimately fail to fit are returned to the list of unknown/rejected observations.

Once the first analyst is done, a second analyst looks at the remaining unknown/rejected observations and attempts to build entirely new orbits. The resulting orbits account for objects that recently appeared in space due to launches or break ups. If any promising orbits are developed, the salient observations are removed from the unknown/rejected list and added to the database as a new but unknown satellite. When the second analyst is complete, the remaining observations are written back to the holding file for consideration the next day.

As noted above, 98.5% of all observations are automatically fitted to the database. The remaining observations, approximately 21,000 per month, are left to the human analysts. The most common causes of failure to fit are (Naval Space Surveillance Command, 1990, p. 3):

- **Satellites that are infrequently observed.** Due to orbital orientation or high eccentricity, some objects are not viewed often enough to maintain a current set of orbital elements. As the epoch of the element set grows older, the accuracy of predicting the object's motion decreases.

- **Satellites that are in high decay orbit.** The present model can not account for objects approaching reentry or objects with rapidly increasing drag.

- **Satellites that are maneuvered.** Changing the orbit of an active payload produces a new set of elements. If the maneuver is small enough, the change will be detected as an error which can be accommodated. If too large, the maneuver may render the old element set useless.

- **Solar activity.** Solar flares increase upper atmospheric drag, resulting in accelerated orbital decay. Again, the present model can not take this into account.

III. PURPOSE OF THESIS

The goal of this research is to determine the feasibility of using an expert system to correlate UCT's to the NAVSPASUR orbital catalog. As envisioned in Figure 3, such a system would ultimately replace the human expert with a computer program with equal capabilities. Although an implementation is beyond the scope of this work, as much code as possible was written to validate ideas and algorithms. Where code has not been provided, conceptual solutions are outlined.

Addressing the correlation of UCTs with an expert system is appealing for several reasons. First, heuristic methods are computationally tractable while current analytical solutions are not. *Special theory* models, which predict satellite motion through integration instead of propagation, are available with accuracies in tens of meters instead of hundreds. These algorithms contain more detailed models of upper atmospheric density, the main source of error in the NAVSPASUR implementation. Unfortunately, the additional accuracy comes at the cost of several orders of magnitude in computing resources (Naval Research Laboratory, 1991, p. 1). By contrast, the complexity of an expert system is governed by it's rule set and, depending on intracity of that knowledge, could prove quicker to run. A knowledge-based system has the further advantage of being used only when needed on actual UCTs, while a more accurate orbital model would be needlessly applied to all observations, including the 98.5% that already conform to the Brouwer-Lydanne model.

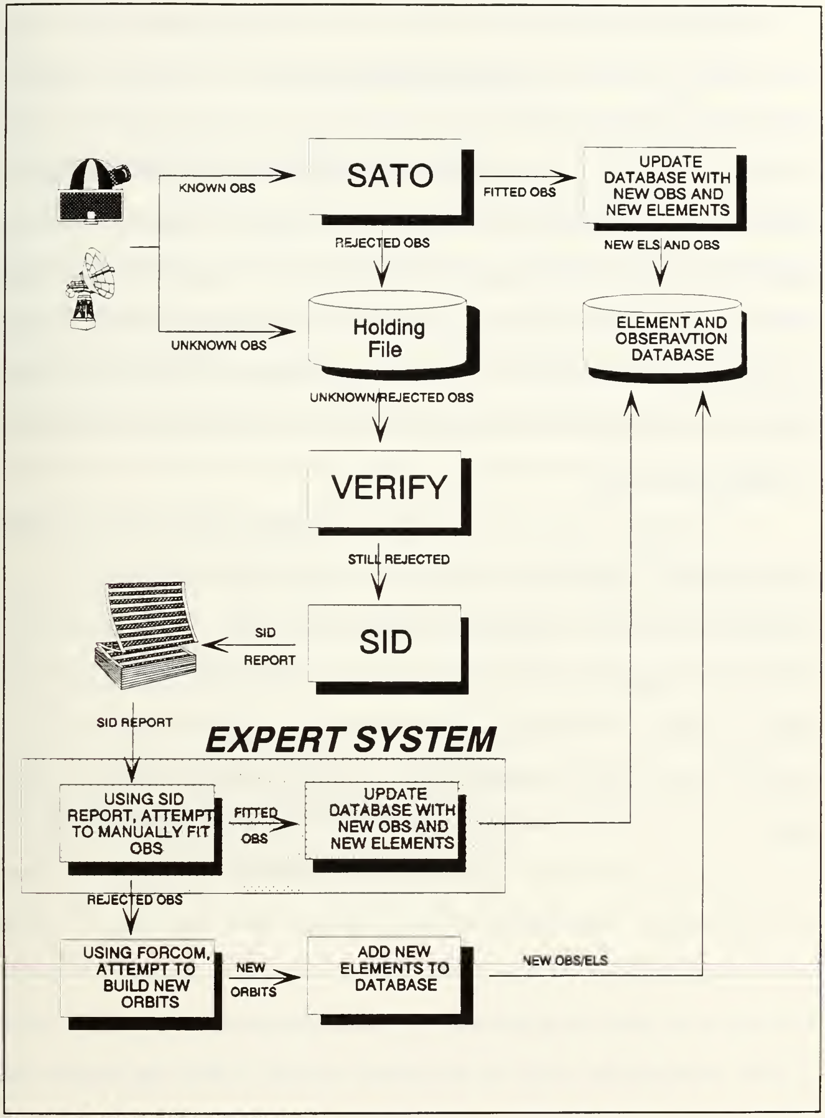

KNOWN OBS
SATO
FITTED OBS
UPDATE DATABASE WITH NEW OBS AND NEW ELEMENTS
REJECTED OBS
NEW ELS AND OBS
UNKNOWN OBS
Holding File
ELEMENT AND OBSERAVTION DATABASE
UNKNOWN/REJECTED OBS
VERIFY
STILL REJECTED
SID
SID REPORT
SID
SID REPORT
EXPERT SYSTEM
USING SID REPORT, ATTEMPT TO MANUALLY FIT OBS
FITTED OBS
UPDATE DATABASE WITH NEW OBS AND NEW ELEMENTS
REJECTED OBS
USING FORCOM, ATTEMPT TO BUILD NEW ORBITS
NEW ORBITS
ADD NEW ELEMENTS TO DATABASE
NEW OBS/ELS

Figure 3. Role of Expert System

Perhaps the most important advantage of the heuristic approach is that it might work. Because the orbital analysts are quite adept at fitting UCTs, any expert system that successfully captures and applies their knowledge has at least the potential for equal success. The importance of heuristics to the analysts' solution method is apparent. As previously discussed, the process of fitting UCTs is iterative involving m orbits and n points to fit. Using a worst case scenario of random search, the time complexity is $O(mn)$ to fit all observations. For 7000 orbits and 1500 observation per day to fit, this produces a search space of 10^7 nodes, far too many to work through using simple trial and error. Definitely, the analysts must use some kind of rules of thumb to prune the search tree and guide their efforts.

On an implementation level, the analysts' job appears to be a good candidate for automation via an expert system. The problem is well understood; it defies easy solution by traditional, declarative programming languages; it usually has a correct solution; it can be solved by some people more quickly than by others, indicating that some sort of expertise is involved; the analyst are good at articulating the solution methods they use. Essentially, the problem is one of correlation and mating the correct data to the correct orbit.

IV. METHODOLOGY

A. SELECTION OF COMPUTER LANGUAGES

Two languages were selected for use in this project, C and CLIPS. For routines that do not benefit from an expert system approach, it is sensible to use a more efficient procedural language such as Ada, C, Fortran, or Pascal. Although the majority of code used by NAVSPASUR is currently in fortran, new code is being developed in C to accommodate the transition to an Unix based distributed processing system. To assure compatibility with this new system, an ANSI C compiler was selected. Although C++ constructs were available, they were not utilized.

For the actual expert system, the C Language Integrated Production System (CLIPS) was chosen. First released in 1985 by NASA's Johnson Space Center, it provides both a language and an environment for developing expert systems. Utilizing IF...THEN... rule constructs, it uses a forward chaining, data driven inference engine based on the Rete algorithm. The syntax of the language is similar to Lisp. CLIPS has enjoyed considerable success in the military and government sectors for several reasons: portability, a rich set of development resources, and most importantly low cost (the software is free to government agencies). One interesting feature of CLIPS is that it is written in C itself and can autogenerate executable C code for any expert system written in the CLIPS syntax. Consequently, all the code presented in this thesis can be converted and compiled into ANSI C. (National Aeronautics and Space Administration, 1991)

B. KNOWLEDGE ENGINEERING

Knowledge engineering is the process of eliciting rules from the human expert for use by the expert system. Traditionally, the engineering process develops a rule set through a time consuming, iterative approach involving successive interviews between the system developer and the human expert. For practical reasons, that approach was not possible here. Only one week was available for interviewing and, because of the coast to coast distances involved, multiple trips to NAVSPASUR were not feasible. This limited access to the resident experts may be viewed as a hinderance, but actually prompted an innovative approach to eliciting knowledge through the use of machine learning.

C. INTERNAL REPRESENTATION OF FACTS

On a conceptual level, the experts and the expert system deal with tracks. Tracks are composed of one or more observations and observations are composed of several fields of data. During analysis, the experts are not so much interested in the individual observations themselves as the aggregate features of the tracks as a whole. This implies that facts about a track should be based on statistical values derived from the observations that make up that track. Statistics can provide a variety of parameters for analysis; pertinent ones were selected based on the information gleaned during the knowledge engineering process and refined during the development of the expert system.

D. PREPROCESSING ROUTINES

The building and parameterizing of tracks is performed by preprocessing routines written in C. While this function could have been carried out in the expert system itself, the pattern matching and heuristic capabilities of CLIPS were deemed unnecessary and inefficient for what is essentially a numerical problem.

The original data used in for this research came from the SID report for 12 February 1992. It consists of approximately 100 pages of computer printout which contain over 3000 individual observations and an unknown number of tracks. This text was converted into electronic format through the use of a flatbed scanner with associated OCR software. The resulting ASCII file contained a large number of formatting and character errors, consequently a simple parser was written to tokenize the file, check for errors, and report any discrepancies. Once the data was cleaned up, observations were grouped into appropriate tracks and statistics about each track were then computed. The results were then stored in a separate output file using a format compatible with CLIPS.

The source code for the preprocessing routines is located in appendix E. The listing FILTER.C is for the parser and TRACKER.C for the track building algorithm. While the track building algorithm is pertinent to any real world implementation, the parser is not and was developed solely for this research.

E. EXPERT SYSTEM ARCHITECTURE

Based on the insight gained during the knowledge engineering phase, it became evident that the processing of UCTs breaks down into two functional parts. First, the output from the SID program, the list of uncorrelated observations, must be reviewed for "good" data. Second, an attempt is made to fit these good observations to the satellite database. The first step is necessary for efficiency: although an effort could be made to fit each and every track from the SID output, such an endeavor would be time consuming and impractical.

The second step can tolerate errors from the screening process, since bad data passed by the first step will ultimately fail to fit to the database. However, a penalty is paid in performance since time will be lost while attempting to fit bad observations. A more important concern is errors made during the first step that inadvertently screen out good observations. Such data never reaches the stage of database fitting and is consequently lost. In observing the experts, more time was generally spent trying to fit tracks to the database, however more knowledge was required for the screening of data. Therefore, the emphasis in this thesis is on designing an efficient screening routine.

The overall layout of the expert system is outlined in Figure 4. It consists of two modules, the evaluator and the synthesizer. The evaluator performs the function of screening the input data. It determines the goodness of each track and passes its results on to the synthesizer. The synthesizer performs the task of actually fitting the good data

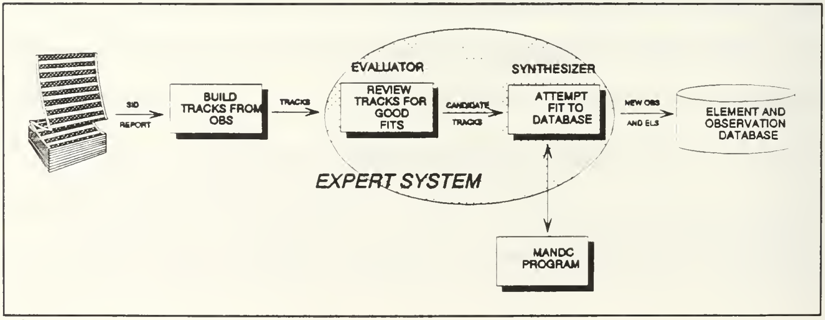


Figure 4. Conceptual Design

to the database. A separate support routine, MANDC, is called during the iterative attempts to fit the data.

1. The Evaluator

a. A Hybrid System

As previously described, the evaluator determines the "goodness" of a track. It utilizes an evaluation function in combination with a traditional rule based expert system. Conceptually, the evaluation function takes the tracks built by the preprocessing routines and performs an initial scoring of each tracks goodness. These scores are then refined by the production system to produce a final ranking from best candidate to worst candidate.

b. Evaluation Function

(1) The Evaluation Process. Evaluation is the process of deciding between a set of options, known as candidates. The purpose is to determine the worthiness of candidates relative to each other with the goal of selecting the best one. As defined by Mitri (1991)

> Evaluation is often described in terms of establishing numeric scores or qualitative ratings for a candidate. Candidates are usually represented in terms of attributes (criteria) that are relevant to the evaluation.

In the case of processing UCTs, the candidates are the individual tracks and the criteria are features of those tracks such as drag, errors along the three axis, and the number of observations in the track. Some of these attributes come from the observations that make up the track while others are based on the association of the track with a particular satellite.

An evaluation function is the algorithm that determines the goodness of a candidate. Often, it is based on a weighted summation where the individual criteria are multiplied by a scaling factor and the results added to produce a composite score. The scaling factors, or weights, relay the relative importance of each criteria.

Evaluation is a process closely akin to categorizing or classifying. However, programs that categorize attempt to assign a candidate to one of several groups while programs that evaluate attempt to determine how well a candidate fits into one particular group. Further, categorizing can be discrete while evaluation is always continuous. Evaluation functions hold two advantages over symbolic computing: they are competent at handling continuous data and they can be generated through machine learning.

(2) Continuous Versus Discrete Data. For the UCT problem, the majority of the facts being examined are continuous, ranging over a set of values. By contrast, symbolic computing expects facts to take on discrete values and must make allowances for continuous variables. This is usually accomplished by dividing the continuous range into subranges and assigning symbolic names to each subrange. As an example, one of the criteria used in evaluating a track is satellite drag which can vary by four orders of magnitude from 10^0 to 10^4. The experts employ rough boundaries that divide drag into the three ranges of average, high, and very high (Jenkins, 1992). For the most part this scheme works well and production rules that use these adjectives in the code are easily understood by the layman. However, problems arise when a value falls near the edge between two ranges. While a drag of .0099 is regarded as average, a drag of .0100 is considered high even though the difference between the two is insignificant.

Berliner and Ackley first addressed this situation, referring to it as a boundary problem which occurs with any mapping of continuous values into a discrete domain. It leads to "fragility" in the expert system, since small differences in the facts can lead to very divergent conclusions. (Berliner and Ackley, 1982)

The solution to the boundary problem lies in reducing the granularity of the data by dividing the ranges into smaller, and consequently more numerous, subranges. Unfortunately, this usually requires an iterative solution with different boundary values being selected, tested, and refined until an acceptable answer is achieved. In addition, more subranges lead to more production rules and greater computational complexity. A more satisfying method would utilize the continuous data directly. An evaluation function is one such method.

(3) Machine Learning. For this particular problem, a second advantage of evaluation functions was found in that they can take advantage of machine learning. Traditional expert system development requires a great deal of knowledge engineering to acquire a viable rule base. This in return demands a substantial investment of time on the part of the expert, who must provide guidance and feedback during the formation of rules. Machine learning techniques use a different tactic. Rather than gleaning knowledge from the expert, they take it from the data. Although the experts participation during system development can not be dismissed, it is certainly reduced and makes their availability less of a factor.

Generation through machine learning is not a property of all evaluation functions, but rather is limited to a subclass of problems. For this research, the function was developed through an application of neural network theory. The neural network was trained on a set of examples provided by the expert and the results used to construct the function. The criteria used as input data, the output results, and the form of the evaluation algorithm were all constrained by the type of neural network selected for use. The specifics are discussed in Chapter V.

c. *Production System*

(1) Domain Knowledge. An evaluation function's usefulness is limited by the input data it can process. Evaluations are based solely on the set criteria provided about a particular candidate; other domain knowledge is not available. Consequently, background information, expert opinion, and context sensitive data are not used by evaluation functions. This inability to use all available domain knowledge to full advantage is a serious liability and several methods have been developed to overcome it. In some of the classical artificial intelligence research in gaming theory, Samuel (1959) used a signature table in conjunction with an evaluation function for a program that played checkers while Berliner (1977) used structured matching in his backgammon algorithm. When trying to determine the next best move to make, both of these techniques supplemented the evaluation algorithm with situational knowledge such as the relative board positions of other pieces and the current phase of the game. The approach taken for UCTs uses a rule based system to compliment and complete the evaluation function. After the evaluation function applies its specific and limited knowledge about certain criteria to produce an initial ranking, the expert system uses other domain knowledge to refine and finalize the rankings.

(2) Development Of Rules. The two sources of rules were background knowledge and expert opinion. Background knowledge included theory in orbital mechanics and aerodynamics (knowledge of first principles) and written reports provided by NAVSPASUR regarding operational procedures (Naval Space Surveillance Command, 1990). The remaining rules were based on interviews with and observations of the orbital analysts. As an example, two rules are presented. The first involves the reliability of sensors while the latter examines the effects of tracks on each other.

One bit of background knowledge regards sensor reliability. Certain radar installations consistently provide accurate range and bearing information while others produce data of questionable quality. The human experts make use of this data to adjust the tolerances for acceptable errors; specifically, allowable ΔU, ΔV, ΔW errors from an unreliable sensor are less than the allowable errors for a more accurate sensor (Jenkins, 1992). The dependability of a sensor changes with time making it a dynamic variable and unusable by the evaluation function which is static. Therefore, knowledge about sensor reliability was encoded into the symbolic portion of the expert system and took the form of the following rule/facts combination

```
(deftemplate sensor
     (field id_number   (type           INTEGER))
     (field reliability (type           SYMBOL)
                     (allowed-symbols GOOD BAD))
); DEFTEMPLATE SENSOR

(deffacts sensors
     (sensor (id_number 334) (reliability GOOD))
     (sensor (id_number 369) (reliability GOOD))
     (sensor (id_number 396) (reliability GOOD))
     (sensor (id_number 404) (reliability GOOD))
     (sensor (id_number 329) (reliability BAD))
);sensors
```

```
(defrule bad_sensor
   (declare (salience 900))
   ;Reduce rankings for tracks from unreliable sensors. The amount
   ;of reduction is 10% here, but that number needs to be verified.
   ;Not enough data available to date to really test it
   (flags (bad_sensor T))
   (sensor (reliability ?RELIABLE&:(eq ?RELIABLE BAD))
           (id_number ?S_BAD))
   ?F <- (track (sensor ?S&:(eq ?S ?S_BAD))(fh ?FH&:(eq ?FH F))(rank ?R))
   =>
   (bind ?R (max (- ?R 10) 0))
   (modify ?F (rank ?R)(fh T))
);bad_sensor
```

The first construct, *sensor*, is a CLIPS template for representing a sensor. The four sensor facts are instances of this class which can be asserted or retracted as the reliability changes. The rule *bad_sensor* performs modus ponens reasoning by looking for a fact about any unreliable sensors and matching it to any tracks that came from that sensor. If a match is found, then the rank of that track is downgraded by 10% to reflect the reduced confidence in the data. This method of adjusting a tracks ranking based on the current set of facts is the general process followed by all of the rules in the evaluator.

As a second example, the halo rule is considered. The experts will ascribe more confidence to a track if it can be associated with other good tracks for the same satellite. Several factors go into the evaluation including the total number of tracks involved, the sensors they came from, and the satellites they were originally correlated to by the sensors. The effect is that a group of good tracks reinforce each other and that other tracks, mediocre taken by themselves, receive improved rankings if they are similar to good tracks. Obviously, this halo effect is context sensitive and beyond the capabilities of the evaluation function which can consider only one track at a time.

Several halo type rules are implemented in the system. The following one accommodates short tracks with only one or two points being similar to longer tracks.

Note that for this rule to fire, both tracks must come from the same sensor, the good track must be longer than two points (indicated by P > 20), and the good track must be of higher ranking itself (R2 > R).

```
 (defrule halo-short_track
   (declare (salience 700))
   ;Advance rankings for 1-2 point tracks that are close in time
   ;to good tracks. Ranking of short track is set equal to longer if
   ;    - Obs came from same sensor
   ;    - The longer track has at least 3 points
   ;    - The u, v, w errors are approximately the same
   ;    - The tracks are within an hour of each other. This should
   ;      be refined as better epoch data is passed to CLIPS.
   ?FLAGS <- (flags (halo T))
   ?F <- (track (points ?P&:(< ?P 21))(julian ?J)
                (satellite ?SAT)(sensor ?S)(rank ?R)(hour ?H)(w ?W))
   (track (satellite ?SAT2&:(eq ?SAT2 ?SAT))
          (sensor ?S2&:(eq ?S2 ?S))(points ?P2&:(> ?P2 20))
          (hour ?H2&:(< (abs (- ?H2 ?H)) 1))
          (julian ?J2&:(eq ?J2 ?J))(rank ?R2&:(> ?R2 ?R))
          (w ?W2&:(approximately_equal ?W ?W2 .10)) )
   (not (track (julian ?J)(satellite ?SAT)(sensor ?S)
               (rank ?R3&:(> ?R3 ?R2))))
   =>
   (modify ?F (rank ?R2)(halo T))
);halo-short_track
```

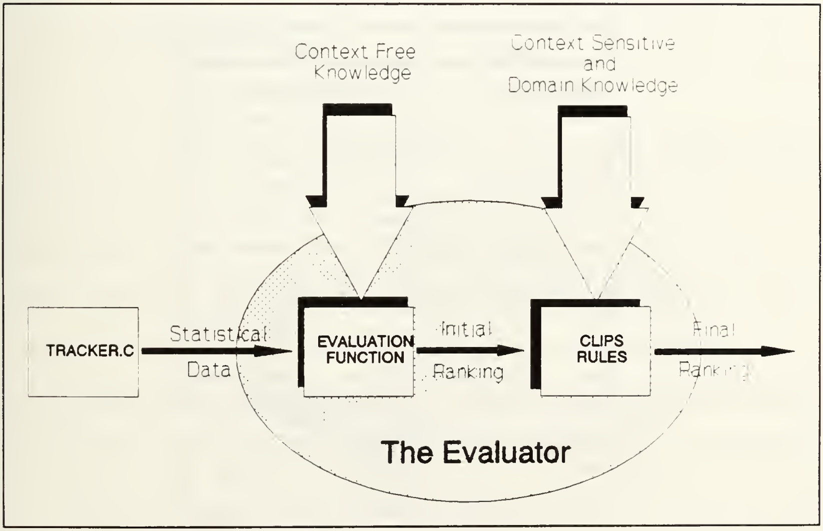


Figure 5. The Evaluator

d. Implementation

Figure 5 presents a conceptual view of the evaluator. The evaluation function bases its ranking of each track on the eight attributes in Table 2. These attributes are provided by the preprocessing routine TRACKER.C which has mapped them into the continuous range of (0,1). The output of the evaluation function, a percentage from 0 to 100, is a measure of worthiness with 100% being the best score and 0% the poorest. The coding of the evaluation function is straight forward, requiring only three lines of C code.

TABLE 2. EVALUATOR FEATURE SET

PARAMETER	REMARKS
Satellite Drag	Orbital decay rate
Satellite ID	TRUE if original sensor tag matches current satellite
Satellite Period	The orbital period
Points	Number of points in the track
$\Delta W > 10$	The number of individual ΔW errors in the track greater than 10
ΔU	The RMS error along the U axis of the points in the track
ΔV	The RMS error along the V axis of the points in the track
ΔW	The RMS error along the W axis of the points in the track

Regardless of evaluation function score, all tracks are passed to the production system to determine a final ranking. Applying domain knowledge not available to the evaluation function, the knowledge based system adjusts the rankings to produce the final output.

As a whole, the evaluator makes best advantage of the individual strengths of the two paradigms. The evaluation function applies the empirical, context free knowledge to the data. Through its compensatory grading algorithm and ability to handle continuous data, it overcomes potential boundary problems and system fragility. The production system then applies the domain dependent, context sensitive knowledge to the data. Using rules with conjugative clauses, it allows for interdependencies in the available facts. The result is a system that employs statistical analysis and connectionism with logical reasoning and symbolic computing.

2. The Synthesizer

a. Solutions By Synthesis

Once a track is deemed acceptable, the task remains of fitting it to the database. Using a least means square algorithm, effort centers on finding the orbit that most closely fits a given set of tracks. Initially, the original element set for the object is used to propagate a curve. Based on the fit error between each observation and this curve, the expert makes decisions on which tracks to keep and which to ignore. This new set of tracks is then used to determine a new element set and, by propagating another curve from this new element set, another set of fit errors is computed. The expert continues to refine the selection of observations until a suitable orbit is found. (Naval Space Surveillance Command, 1990, p. 5)

As shown in Figure 6, the above process is dynamic with the element set effecting the fit of the tracks and the selection of tracks effecting the element set. The solution is found by synthesis with the expert proposing alternate sets of tracks in an attempt to converge on a single answer.

b. MANDC

The primary tool used to guide the experts to a solution is the software routine Manual Differential Correction (MANDC). MANDC computes the effects of tracks and element sets on each other and presents the results to the orbital analyst for consideration. As an example, consider the following MANDC output:

```
SAT.NO.= 21429   IN.DESIG.=91 043 D   ORIGIN=USSR    TYPE=R.B.
921025  152332.08 -21.88   7.40   0.00  2231   294  309.72  47.63     0.00
921026  120920.47  -9.75  29.48  -3.77  2231M  295  323.06  30.39     0.00
921030  201006.93   4.72   9.38  -3.98  2231A  296  138.55  20.90  3703.52
921030  201058.98   5.41  10.82  -4.18  2231M  297  136.22  23.11  3747.95
921030  201207.05   2.81  10.62  -1.11  2231E  298  133.11  25.79  3816.20
921031  203159.65   7.59   8.02  -1.44  2231E  299  156.37  17.48  3439.94
921031  203321.58  10.19   9.07  -1.79  2231E  300  153.01  22.04  3462.54
921031  203449.61   7.87  11.25  -2.40  2231E  301  149.19  26.67  3510.71
921031  203719.19  10.11  12.38  -2.46  2231E  302  142.06  34.11  3653.89
921031  203745.07   9.33  11.36  -2.46  2231E  303  141.31  34.76  3671.63
921031  203913.05  10.00  14.34  -2.75  2231E  304  137.20  38.28  3779.95
  SATELLITE=21429  EPOCH=921031  203913.05  SET NO.=  384.  REV NO.=  988.
PERIOD   PDOT     M3       ECC   INC    RA      AP       RADOT   P/HT  A/HT
732.247  0.00000  0.      .7317  63.21  277.70  283.54    -.13   455.  21718
732.247  0.00000  0.      .7317  63.21  277.70  283.54    -.13   455.  21718
TOL=100.  %=100.0  RMS= 11.07  SPAN=  6  ITER=  0  %SN= 77.1
    11001111  SIG TO NOISE          9.97
    00000000   1,    2/  2,    3/   4,   4/  8,    6/  16,    7/
21429  921031203913.046   732.247489   0.0000000   0.           .73166692
21429   63.20871  277.70211  283.53852  13.46930  91  143 D  2  3  988  384
```

The first line, basic information about the identify the object, is followed by several lines of observation data. This information includes the epoch of the observation along with the ΔU, ΔV, and ΔW errors associated with the fit. Below the observations are two lines with column headings of PERIOD, PDOT, M3, ECC, INC, RA, AP, RADOT, P/HT, and

A/HT. Of these, the expert is most concerned with the satellite's period (PERIOD), the satellite's drag (PDOT), and the orbital inclination (INC). The first line of data is information currently stored in the orbital catalog about the object. The second line is changes in that information that will take effect if the experts current selection of tracks is used to generate a new element set. As various sets of tracks are attempted during the synthesis process, these two lines can be monitored to determine the impact of the changes. One final piece of information is labelled RMS and represents the root mean square error between the latest curve and the set of tracks.

c. Rules Guiding The Synthesis Of A Solution

Several rules are used by the experts to reach a final combination of orbital elements and tracks. The overall goal is to minimize RMS while keeping the decay

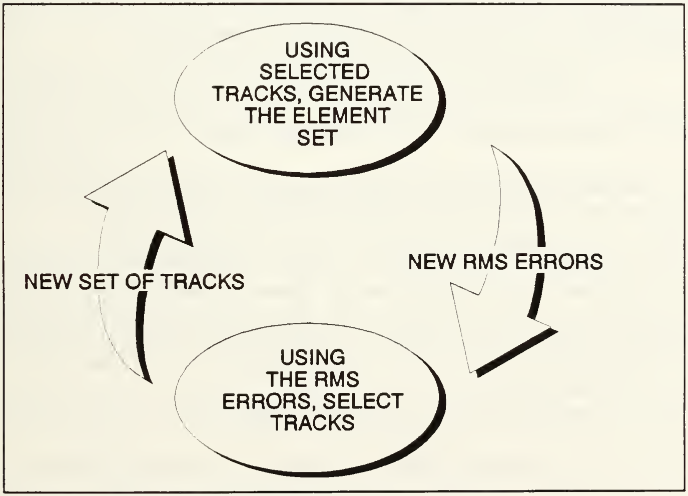

USING SELECTED TRACKS, GENERATE THE ELEMENT SET
NEW RMS ERRORS
USING THE RMS ERRORS, SELECT TRACKS
NEW SET OF TRACKS

Figure 6. The Synthesis Process

(PDOT) and inclination (INC) reasonable. An acceptable RMS is one that is less than 1% of the orbital period so that, for example, a geosynchronous spacecraft with period 1,440 minutes requires a RMS of less than 14 (Jenkins, 1992). With this RMS, PDOT must be reasonable which means it can not be positive, an indication that the satellite's energy is increasing. Nor can PDOT change in magnitude a great deal, unless the object is approaching reentry into the earth's atmosphere. In like manner, INC must be reasonable. Inclination is a parameter that varies very slowly, consequently the final INC can be no more than a degree different from the initial one.

A fit is made by adjusting the span of tracks that MANDC uses to generate an element set and associated orbit. The orbital catalog maintains at least the last 75 observations, however due to the ever changing element set only the last few are useful for determining the current orbit of the object. Defaults are built into MANDC for selecting a span which the expert overrides to improve the fit. Spans are continuous, covering all observations from some starting time to the present.

Confidence in an orbit increases as more tracks are used to build it, consequently when selecting a span the maximum number of observations possible are used. As a minimum, a span of three tracks is required to achieve any meaningful results. In addition to the number of tracks, the expert must also consider the time interval covered by the span. Three tracks within ten minutes of each other produce a span with an acceptable number of tracks but an unacceptable time duration. Preferably, the span will cover a few days time.

Besides changing the start time, the experts can modify a span by deleting some of the tracks in it. This must be done with care, since eliminating a track means it was incorrectly correlated to this object sometime in the past. However, in situations with a large number of tracks that fit well and a single poor one, it may be prudent to remove the errant observations.

While other procedures are used by the experts in an attempt to improve the fit of the data, the majority of effort centers on selecting a correct span.

d. General Solution

As originally envisioned, the synthesizer portion of the expert system would perform the task of fitting tracks to the database. To work properly, repeated calls must be made to MANDC. Unfortunately, MANDC is currently operative only on NAVSPASUR's computer. Runtime access to this system was not available and modifying the program to operate on another system is a software engineering challenge beyond the scope of this thesis. Consequently, no CLIPS rules were developed and tested. However, a general solution algorithm is provided that captures most of the information gained from the experts.

The main loop is shown in Figure 7. After adding the new track, repeated calls are made to the MANDC routine. The calling loop is exited when the fit is satisfactory or no progress is being made. For a satisfactory fit, the magnitude of RMS should be less than 1% of the period, the new PDOT should be approximately equal to the old PDOT, the new PDOT should be less than zero, and the new INC should vary from the old INC by less than a degree. The other exit condition, NO PROGRESS, occurs when several iterations through the loop fail to decrease the magnitude of RMS.

The next line in the loop adjusts the span after checking if the fit is close. If the fit is less than roughly 150% of the acceptable value, the experts will not adjust the span but rather will continue to call MANDC to see if RMS will decrease on its own. Multiple calls to the subroutine refines the element set and has the potential of improving the fit of the tracks. The expert will continue to iterate as long as it appears an acceptable RMS will ultimately be achieved.

Lacking a RMS that is close, the expert will adjust the span. Whether the span is lengthened to include more tracks or shortened to hold fewer depends on the

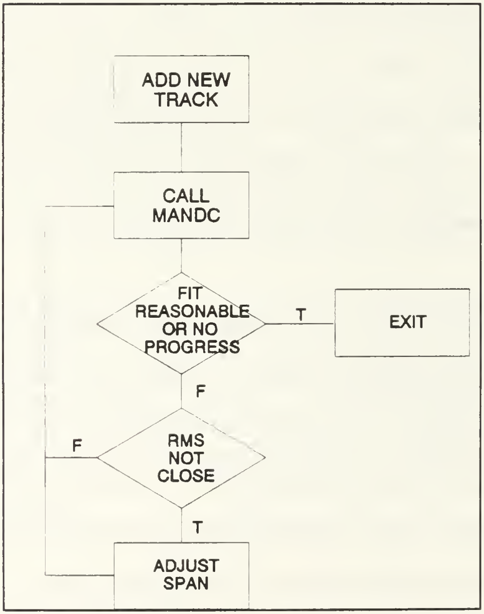


Figure 7. The Main Loop

data. If the default span provided by MANDC has few observations, the expert will tend to lengthen it and vice versa for a span with many observations. Shorter spans are generally used on satellites with a high decay rate, but rarely are they shortened below the 3 track minimum. Again, the goal is to achieve a satisfactory fit while retaining as many tracks as possible.

If adjusting the start point of the span does not yield results, tracks that do not fit well will be examined an potentially eliminated. A poorly fitting track is noted by ΔU, ΔV, and ΔW errors much higher than the average for the span.

The expectation is that repeated adjustments of the span will produce an acceptable fit. If it does not and no progress is being made, the experts differ on a next course of action to follow. If PDOT is causing problems, the expert may set its value at 0 and force MANDC to perform calculations without orbital decay. Alternately, a different element set can be used. The orbital catalog actually contains four element sets from various sources for each object. Usually, the experts work with NAVSPASUR's own internally generated element set, but using one of the others may lead to a solution when the NAVSPASUR one does not.

Should all these efforts fail, a track will eventually be ruled as not belonging to the object and returned to holding file for reconsideration the next day.

V. DERIVING THE EVALUATION FUNCTION

A. EMPIRICAL LEARNING

Shown graphically in Figure 8, classification describes a real world instance in terms of features and then uses those features to make an assignment to a class (Hirsh and Shavlik, 1992). Given **n** features and **m** classes, the function $\mathcal{F}$ performs a mapping from the **n**-dimensional feature space into the **m**-dimensional class space

$$\mathcal{F} : \Re^{n} \rightarrow \Re^{m}$$

Evaluation can be viewed as a type of classification where **m** equals one, so there is only one class and membership in that class is continuous vice discrete.

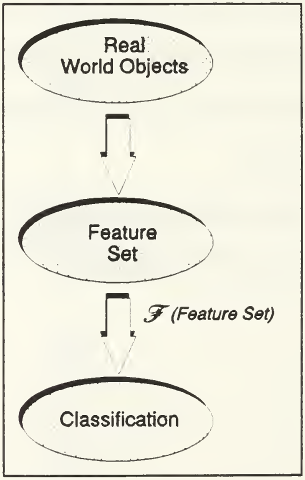


Figure 8. Classification Process

As applied to classification, machine learning employs an automata to find the function $\mathscr{F}$. This implies using the computer to determine the relationship between a set of features and membership in a class. Specific to developing an evaluation function for ranking satellite tracking data, the computer must ascertain how drag, satellite period, and other factors impact the quality of a given track.

One method of machine learning, inductive learning, presents the computer with a large number of positive and negative examples that are used for training. The examples serve as input/output pairs from which the machine induces the function relating the two. For classification, the input consists of features or attributes while the output is the known class of the particular example. Through repeated exemplars, the relationship between the feature set and the classification is uncovered. Once successfully trained, novel and unknown instances can be accurately classified using the learned relationships. (Hirsch and Shavlik, 1992)

With inductive learning, knowledge acquisition focuses on the data vice the expert. Although they must still provide the set of examples for training, the expert's involvement with the knowledge engineering phase is reduced and often indirect. This lessens the knowledge engineers need for access to the specialists, freeing the experts to pursue other tasks. In addition, the functions and relations found through machine learning tend to be simpler and more general than those produced by humans. While the computer is unbias, experts often have preconceived notations such that they "can not always see a simple pattern or principle, and often suggest overly complex rules when they describe what they think they ought to do, rather than what they actually do" (Hart, 1986, p. 112).

Past endeavors in inductive learning include ID3 which used statistical analysis to produce a rule base for a production system (Hart, 1986, p. 114). Another approach that derives rules, AQ, resulted in an system for diagnosing soybean diseases that out performed the hand coded expert system (Hart, 1986, p. 112). Recently, research has expanded into the fields of genetic algorithms and artificial neural networks, both of which work well with continuous and numerical data.

B. ARTIFICIAL NEURAL NETWORKS AS CLASSIFIERS

1. Vector Quantization

Geometrically, the feature set used to describe an instance is a **n**-dimensional vector. A vector quantization algorithm will map a potentially infinite number of these feature vectors into a **n**-dimensional hyperspace such that they cluster around a set of **m** codebook vectors. The goal of vector quantization is to reduce the complexity of the input by mapping it from **n** dimensions into a lower dimension space. This grouping of vectors then permits a more convenient analysis of the original data. (Merelo, 1991)

For classification, effort centers not so much on reducing the complexity of the input data as to the assignment of feature vectors to the correct cluster and associated class. Consequently, the dimensionality of the problem may increase if there are more classes than there are features, i.e., $\mathbf{m} > \mathbf{n}$. Despite this difference, the underlying mechanics are the same and focus on selecting an appropriate set of codebook vectors. In its simplest form, one codebook vector exists for each of the **m** classes and, as shown in Figure 9, points to the center of the region in **n** hyperspace where that class resides. The codebook vector is a quantized representation of that class; it is a prototype vector that defines the class. Vector quantization reduces the classification problem to one of finding the prototype vectors for each class. (Kosko, 1992, p. 112)

2. Learning Vector Quantization

One method for determining the codebook vectors is by learning vector quantization (LVQ). Originally proposed by Kohonen (1988), it uses inductive learning to train a neural network as a classifier. The training process results in the quantized vectors for the various classes being embodied in the weight matrix of the neural network. Training is accomplished through competitive learning, a substantially different approach than the more common back propagation algorithm. Under competitive learning, neurons in the hidden layers of a neural network respond to an input by contending with each

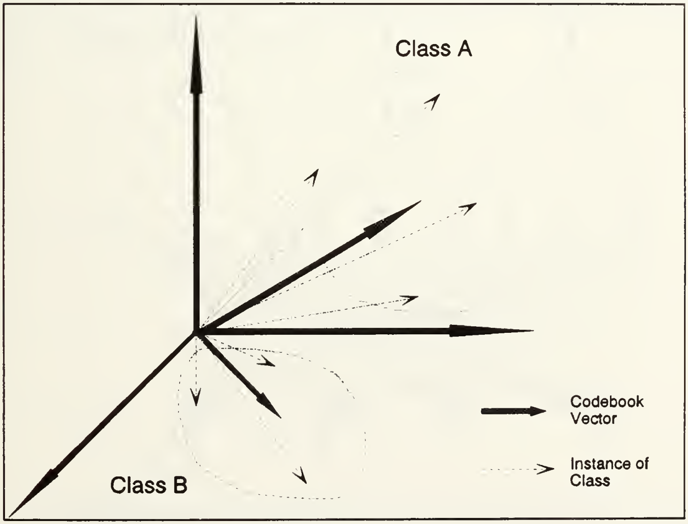


Figure 9. Vector Quantization

other until the strongest one wins. The winner then adapts itself in such a way that it will respond more strongly the next time the same input pattern is presented.

Kohonen's LVQ network uses an input, output, and single hidden layer. The input layer is composed of **n** nodes, one for each feature, while the output has **m** nodes, one for each class. These layers are connected to a hidden layer divided into clusters of equally numbered neurons. There is one cluster per output node, therefor the number of hidden clusters also equals the number of classes.

Figure 10 is a sample LVQ network. It assumes four input features and three output classes. Three nodes have been arbitrarily assigned to each of the hidden clusters;

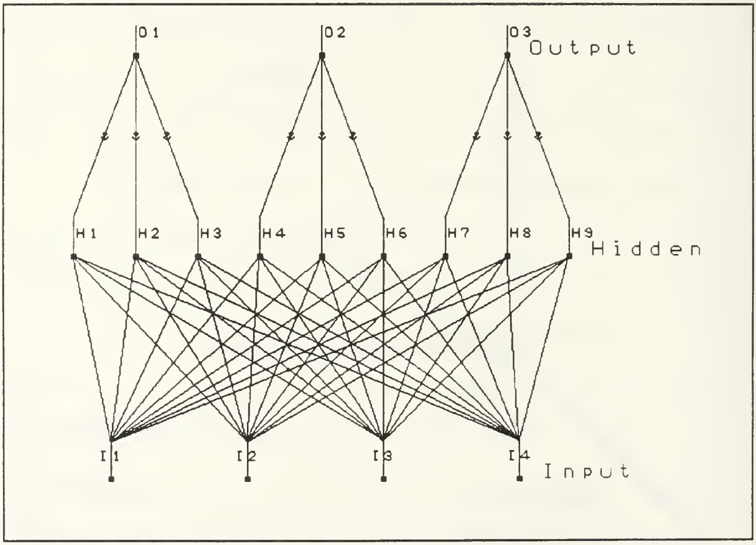


Figure 10. LVQ Network

the actual number necessary depends on the complexity of the problem. During training, an input pattern is presented to the first layer which distributes it to the hidden nodes. The hidden nodes activate in response to the input. The neuron with the highest activation wins and becomes the only node to train during the current iteration. The weights on the connections coming into the neuron are adjusted according to the learning formula

$$\vec{w}'_j = \begin{cases} \vec{w}_j + \alpha(\vec{I}-\vec{w}_j) & \textit{if winning neuron in correct class} \\ \vec{w}_j + \alpha(\vec{I}+\vec{w}_j) & \textit{if winning neuron in incorrect class} \end{cases}$$

where

$\vec{w}'_j$: *weight vector for jth neuron after training*

$\vec{w}_j$: *weight vector for jth neuron prior to training*

$\vec{I}$: *input vector (the feature vector)*

α : *learning rate*

As shown in Figure 11, the effect of training is to move the winning node's weight vector towards the input pattern if the winner belongs to the same class as the input. Otherwise, the winner is repulsed away from the input.

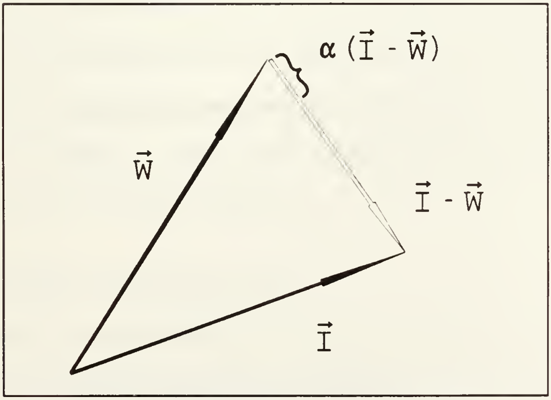


Figure 11. Effect of Training

Activation of the hidden nodes is based on euclidean distance

$$a_j(\vec{I}) = \left[\sum_{k=1}^{n} (w_k - i_k)^2\right]^{\frac{1}{2}}$$

where
a_j : *Activation of jth neuron*

The winning node during each iteration of training is the one with the smallest distance. Consequently, the LVQ network works as a nearest neighbor classifier, with the weight vector closest to the input pattern producing the highest activation. Repeated training adjusts the weights of the hidden nodes until they point at the centroid of the example vectors that make up a class. The weights converge to a mean average and thus become the vector quantization, or codebook, for the class.

The existence of multiple nodes per cluster implies multiple codebook vectors per class. The need for more than one neuron occurs when complicated boundaries exist between classes, shown in two dimensions in Figure 12. Alternately, the different nodes

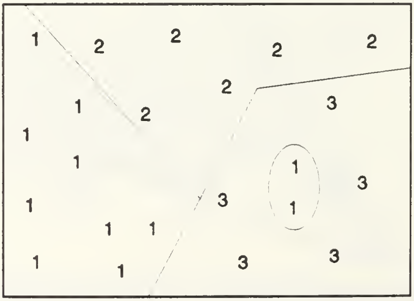


Figure 12. Complex Class Areas

in a single cluster may be viewed as subclasses of a larger class. Regardless of the interpretation, the effect of the output layer is to gather up the nodes of a cluster into a single class. In the LVQ network, the output also performs a binary mapping with the node associated with the selected class producing a 1 and all other nodes a 0.

Selecting the correct number of neurons for the hidden layer is problematic. The optimum solution will choose enough nodes to properly define a class and no more. If too many are used, the network will have the capacity to "memorize" each input rather than learning. As fewer nodes are retained in the hidden layer, the network is forced to generalize and subsequently forms the desired prototype vectors for each class. In the limiting case, only one node is used per cluster, producing only one prototype vector per class and the most general solution possible.

The LVQ network requires more than one node in the output layer to permit differentiation between a minimum of two classes. This presents some problems for evaluation, since the goal is to find the degree of membership in a single class. The solution lies in dividing the training set into two groups, those that are considered a member of the class and those that are not. These groups can be called **Accept** for the positive examples and **Reject** for the negative, although in reality all the examples are acceptable and rejectable to varying degrees. The network is then trained on the examples using this crisp, discrete membership.

C. CORRELATION AND FUZZY SETS

Mathematically, correlation refers to the degree that two sets of data vary linearly with each other. It is measured by the correlation coefficient which resides in the range

(-1,1), varying from negative correlation (one set of data increase as the other decreases) through no correlation (no linear relationship) to positive correlation (both sets increase together).

Because it uses competitive learning with a metrical activation function (the euclidean norm), the LVQ network is a classical correlation detector (Kosko, 1992, p. 147). Although it does not compute correlation coefficients directly, the neural network does provide an empirical assessment between the existence of a feature and membership in a class. This implies that the performance of the LVQ network will improve as the relationship between input features and output classes becomes more linear.

As an example relevant to UCTs, drag is considered. Assuming that a given drag has a given effect on the acceptability of a track, for correlation it is desired that twice the drag have twice the effect. However, this is not the case. When evaluating drag, the experts are influenced by changes in order of magnitude vice linear changes (Jenkins, 1992).

Through the use of a fuzzy set membership function, a mapping is possible that captures the relationship between drag and acceptability of a track. The experts consider drag in the range -.0000 to -.0099 as average, -.0100 to -.0999 as high, and -.1000 and above as very high. Using these divisions, a fuzzy set for drag is

$$DRAG = \{x, \mu_A(x)\} \qquad x \in X$$

$$\mu_A = \begin{cases} -\dfrac{\log(-x)}{4} & x < 0 \\ 0 & otherwise \end{cases}$$

where

X : *the continuous space for drag, 0 to* $-1x10^4$

x : *an instance of the set* X

DRAG : *The fuzzy set of low drag*

The use of the membership function is intuitive and works well with continuous data. Since it maps the drag linearly into a range of (0,1), it makes for easier qualitative analysis of the data. With fuzzy sets, a drag of 0.50 truly is twice as high as a drag of 0.25. The membership function must comply faithfully with a priori knowledge of the set; other than this constraint, its selection is somewhat arbitrary.

D. EXTRACTING THE EVALUATION FUNCTION

With training completed, the neural network's weights can be used to build an evaluation function. Once the evaluation function is determined, the network can be dispensed with. A fuzzy set interpretation is convenient here and will be used in the derivations. The weight vector for the **j**th hidden node is

$$\vec{w}_j = [w_1 \; w_2 \; w_3 \; \ldots \; w_n]$$

where
w_n : *Weight of connection from nth input node to current node*
n : *Total number of input nodes, equal to the total number of features*

Assume an arbitrary instance to be classified with a feature vector given by $\vec{I}_j = [i_1 \; i_2 \; i_3 \; \ldots \; i_n]$. The degree of membership in the class represented by the jth node becomes

$$\mu_j(\vec{I}) = 1 - \frac{\left[\sum_{k=1}^{n} (w_k - i_k)^2\right]^{\frac{1}{2}}}{S}$$

where
μ_j : *Membership function for jth class*
S : *Scale factor*

The summation is the euclidean distance between the feature vector and the class' quantization vector. The scale factor normalizes the distance and is equal to the maximum possible value the summation can assume. If multiple neurons are assigned to a single cluster, and therefor to a single class, the membership function is the fuzzy union of the individual membership functions

$$\mu_{CLASS}(\vec{I}) = \mu_j(\vec{I}) \vee \mu_{j+1}(\vec{I}) \vee \ldots \vee \mu_{j+l-1}(\vec{I})$$

$$= MAX[\mu_j(\vec{I}), \mu_{j+1}(\vec{I}), \ldots, \mu_{j+l-1}(\vec{I})]$$

where
μ_{CLASS} : *Class membership function*
μ_j : *Membership function for the jth subclass*
l : *Total number of neurons (i.e., subclasses) in a cluster*

The output layer of the LVQ network requires a minimum of two neurons and produces binary outputs to indicate the classification of an instance. Conversely, the output of an evaluation function is a single number whose range is continuous. As described above, a fuzzy set membership function based on the euclidean distance provides the desired continuity.

The problem of a single output must still be addressed. Since the network was trained on two classes, again arbitrarily designated **Accept** and **Reject**, one choice is to use an instance's membership in the class **Accept** as the evaluation function

$$\mu_{GOOD} = \mu_A$$

where
μ_{GOOD} : *Membership in the class of good tracks*
μ_A : *Membership in the Accept class*

This approach is somewhat unsatisfying, since it ignores any information about the membership of the instance in the **Reject** class. Consider the situation portrayed in Figure 13, where two feature vectors $\vec{I}_1$ and $\vec{I}_2$ are being evaluated. This example shows two quantized vectors for each class. Assuming $\mathbf{d}_1$ approximately equal to $\mathbf{d}_2$, the two feature vectors would have equal membership in the **Accept** class and would be evaluated as the same. However, the distance from $\vec{I}_2$ to the **Reject** prototype vectors is greater than the distance from $\vec{I}_1$ to **Reject.** A more intelligent membership function would take advantage of this information and realize that the second vector has less in common with the **Reject** class than the first. This suggests an evaluation that uses the fuzzy set difference between the two classes:

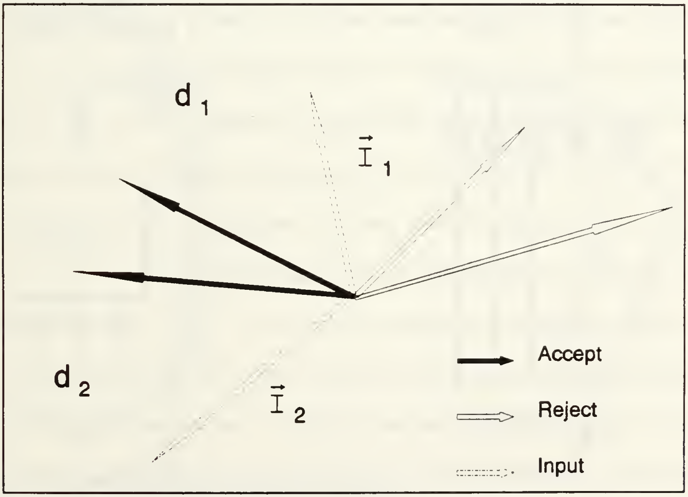


Figure 13. Class Membership

$$\mu_{GOOD} = \mu_A - \mu_R$$

where
μ_{GOOD} : *Membership in the class of good tracks*
μ_A : *Membership in the accept class*
μ_R : *Membership in the reject class*

Since μ_A and μ_B both have a range of (0,1), μ_{GOOD} has a range of (-1,1). This can be mapped back to (0,1) by offsetting and scaling the function

$$\mu_{GOOD} = \frac{1 + \mu_A - \mu_R}{2}$$

E. FUNCTIONAL LINKS

The activation of the neurons is based on the euclidean norm, a non-linear function which contains powers of dependent variables but no products. As such, the LVQ network can not account for joint attributes: features that taken alone have one meaning but when considered together have another. Consider a network for classifying overweight people. Looking only at the feature **height** with a value of 5' 2" tells the system nothing about whether an individual is overweight. Likewise, the feature **weight** with a value of 170 lbs conveys only the idea that the person is big. However, taken jointly, the two features provide a basis for classification. The true impact of these features comes from their conjunction, not their individual values.

Without modifying the network, there are two ways to accommodate joint attributes, either prior to the LVQ network or after it. As shown in Figure 14, the first method requires passing the feature set through the network and then handling the joint attributes with some type of post-processing algorithm. For UCTs, the rule based system already exists to apply domain knowledge and could be expanded to cover this situation. A second method is to operate on the feature set first and then convey the results to the network. This is the approach taken with functional links.

Functional links were originally proposed as a method for providing more information to a neural network (Klassen, 1988). By applying non-linear operators to the input, the data complexity increases while the network complexity decreases. Figure 15 shows how the exclusive-or network, using the identity function for activation, can be simplified by the addition of the non-linear input, $\mathbf{x_1 x_2}$. Various non-linearities have considered such as products, powers, and fourier expansions of terms.

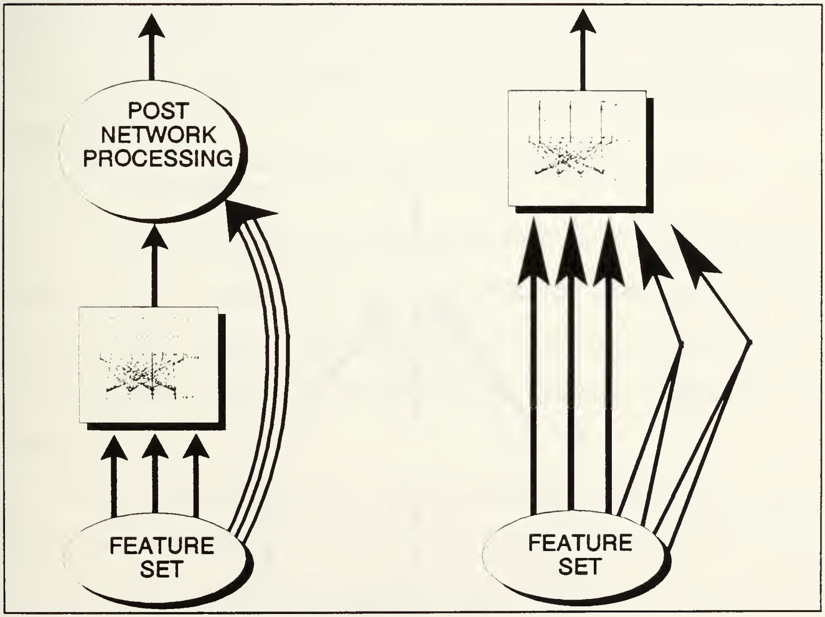


Figure 14. Alternate Methods for Joint Attributes

In similar fashion, functional links can provide a conjunctive term that can account for joint attributes and contextual knowledge. The effect is the same as the **AND** clause in an expert system rule, though the application is limited strictly to the feature set. Unfortunately, like much of the design work associated with neural networks, there are no set methods for determining which non-linear combinations are pertinent. Guidance must come from knowledge engineering or trial and error.

F. IMPLEMENTATION

1. Membership Functions

Membership functions for fuzzy sets are contained in the preprocessing C routine TRACKER.C, which maps the features used by the evaluation function (and the

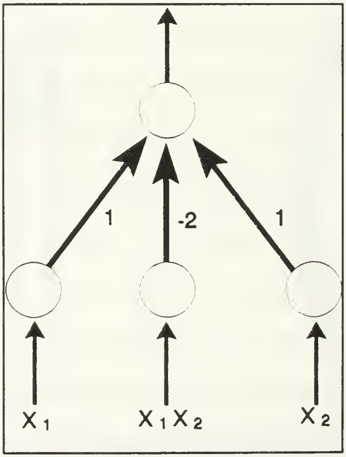


Figure 15. Simplified XOR

neural network) to the range (0,1). Based on principles developed during the knowledge engineering phase, determining the functions turned out to be a straight forward process.

2. Training Data Set

For proper training, the LVQ network requires a data set that contains an equal number of examples from each class. For the UCT problem, this dictates an equal number of good and bad tracks. The sample set from the SID contains 1445 tracks, however only 150 were deemed good by the experts while the vast majority were rejected. In addition, several of the good examples were selected not for their feature set, but for reasons dictated by other domain knowledge. For example, observations from sensor 369 are generally accepted as valid regardless of the ΔU, ΔV, and ΔW errors. These tracks had to be screened out of the training set so as not to provide contradictory information to the network. As a result, the final training set contained 230 examples from which the network could learn.

3. Neuroengineering

Because the required size of the network can not be determined in advance, a large, complex network was built using 17 input nodes and 7 hidden nodes per cluster. Two output nodes, **Accept** and **Reject**, represent the two classes of tracks, good and bad. This network was then pruned to yield the minimum configuration capable of correct classifications.

To simplify the hidden layer, nodes were removed one at a time from each cluster and the network retrained. The accuracy was then plotted as a function of the number of nodes with the results given in Figure 16. Despite the higher error rate, a single neuron per cluster was attempted because it simplifies implementing the evaluation function and guarantees a general solution, i.e., no memorization on the part of the network.

The original feature set consisted of the 17 items given in Table III. To reduce this set, the weights from a given feature to each node was examined. Unlike networks using back-propagation, the absolute value of the weights are meaningless; rather, it is the relative magnitude of weights when compared to each other that is important. If the weight from a feature to all the hidden nodes is approximately the same, then that feature is not being used to distinguish one class from another. Conversely, a large difference in weights indicates that the feature is working as a discriminator. After several iterations, the eight features in Table IV were found to be important. Two of the features, satellite period and drag, have no weights associated with them. They were not provided to the network as direct input but rather exist in functional links. These two features were known to be important to the experts when evaluating a candidate track, however the LVQ network found no correlation between them an either the **Accept** or

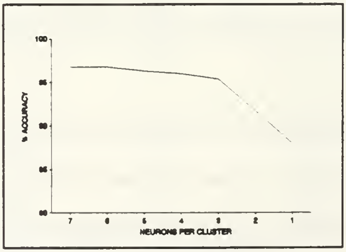


Figure 16. Accuracy vs Neurons

Reject sets. Generally, the greater the magnitude of these two parameters, the greater the tolerance for ΔU and ΔV errors. Consequently, ΔU and ΔV errors were reduced by a scaling factor based on drag and period.

The architecture of the final neural network used for deriving the evaluation function is shown in Figure 17.

TABLE III. ORIGINAL FEATURE SET

PARAMETER	REMARKS
Satellite Drag	Orbital decay rate
Satellite ID	TRUE if original sensor tag matches current satellite
Satellite Period	The orbital period
Points	Number of points in the track
ΔW>10	The number of individual ΔW errors in the track greater than 10
RMS Error	Root mean square error for the track in the three dimensions
Average Error	The average error for the track in the three dimensions
Maximum Error	The maximum error for the track in the three dimensions
Standard Deviation	The standard deviation of the errors for the track in three dimensions

TABLE IV. FINAL FEATURE SET

INPUT FEATURE	WEIGHT TO ACCEPT	WEIGHT TO REJECT
Satellite ID	.4603	.1754
Points	.6411	.3118
Satellite Period	N/A	N/A
Satellite Drag	N/A	N/A
ΔW>10	1.0214	.6962
ΔU RMS Error	.8364	.6942
ΔV RMS Error	.7368	.4871
ΔW RMS Error	.8866	.4636

4. Evaluation Function

The final weights from each feature node to the hidden layer are given in Table IV. Based on these weights, the membership functions for the two classes of **Accept** and **Reject** were determined. The scale values were found by analyzing the input data to find the minimum activation, and therefor maximum value, of the two neurons. By subtracting the two membership functions and offsetting the results, the evaluation function, called **Ranking**, was completed. The results are shown in Figure 18.

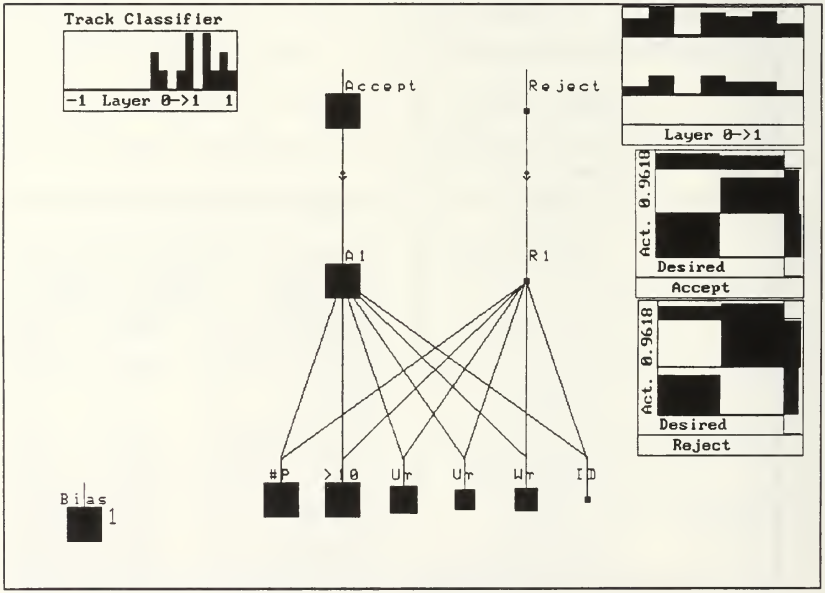


Figure 17. Final Neural Network

$$ACCEPT=[(P-.6411)^2+(W{>}10-1.0214)^2+(\Delta U-.8364)^2+(\Delta V-.7368)^2+ \\ +(\Delta W-.8866)^2+(ID-.4603)^2]^{\frac{1}{2}}$$

$$REJECT=[(P-.3118)^2+(W{>}10-.6962)^2+(\Delta U-.6942)^2+(\Delta V-.4871)^2+ \\ +(\Delta W-.4636)^2+(ID-.1754)^2]^{\frac{1}{2}}$$

where

$P=\textit{Number of points}$

$$=\frac{\textit{Obseravtions in track}-1}{5}$$

$W{>}10=\Delta W \textit{ greater than } 10$

$$=\frac{\textit{Observations with } \Delta W > 10}{\textit{Observations in track}}$$

$DRAG=\textit{Empirical drag of the satellite}$

$$=-\frac{\log(-Drag)}{4}$$

$\Delta U,\ \Delta V,\ \Delta W=\textit{RMS errors in orbital coordinate system}$

$$=\frac{\Delta}{(\Delta_{MAX})(.10 \times DRAG)(PERIOD)^{\frac{1}{2}}}$$

$ID=\textit{Sensor tag is equal to SID tag}$

$=1$ *if true, otherwise* 0

$PERIOD=\textit{Satellite period}$

$$=\frac{\textit{Period in minutes}}{1600}$$

Figure 18. The Evaluation Function

VI. RESULTS

A. SYSTEM PERFORMANCE

The rankings produced by the evaluator are listed in Appendix D. Generally, tracks with a rank of 50% or greater were accepted by the expert while those below 50% were rejected. Based on this observation, the accuracy of the expert system was determined with the results compiled in Table V. Two columns of data are provided, the first being a raw error rate while the second is a corrected rate that removes errors that are implementation vice system dependent.

With an accuracy of 99.1%, the overall system is very effective at ranking tracks correctly and nearly matches the performance of the human experts. Very high accuracy is necessary for the expert system to be of any usefulness. Of the 1445 tracks in the

TABLE V. SYSTEM ACCURACY

CONFIGURATION	ACCURACY, WITH REPEAT TRACKS	ACCURACY, NO REPEAT TRACKS
Evaluation Function Only	90.1	91.4
Evaluation Function with Fuzzy Logic	94.3	95.6
Evaluation Function, Fuzzy Logic, and Rule Based System	97.8	99.1

sample set, more than 1000 were obviously unacceptable, making the process of evaluating them trivial. Consequently, while greater than 90% accuracy from the evaluation function alone is impressive, by itself it can not justify replacing the human experts with a computer program. Only by approaching 100% does the system prove itself viable.

No actual rules were written for the synthesizer module, consequently there are no results for this portion of the expert system.

B. ANALYSIS OF ERRORS

1. Repeat Tracks

A percentage of the errors are not due to shortcomings in the expert system itself but rather come from repeated tracks, an anomaly that would be corrected in any implementation of the system. When analyzing UCTs, NAVSPASUR's SID program often matches the same track to multiple satellites, leaving it to the expert to make a final disposition on which track correlates with which satellite. Usually, the orbital analyst will attempt to fit the track in question to one satellite and ignore the other matchings. This can prove a problem should the expert's choice subsequently prove to be wrong and the track does not fit to the selected satellite's orbit. The approach taken by the expert system is to maintain all satellite/track pairings until the track is actually fitted. Once fitted, the repeat instances of the track are removed from further consideration.

The result is that the expert system may give a high ranking to a track that the expert does not. This does not imply that expert opinion differs from the systems, rather it means that the expert simply never considered the track because the observations had already been used elsewhere and were no longer a concern. The repeat track errors are not errors per se, but rather a by product of the implementation that would automatically be resolved at run time.

2. Actual System Errors

Of the original errors, thirteen are attributable to discrepancies in the expert system. The observations that make up the questionable tracks are:

```
 SAT      INC    PERIOD     DRAG  INTL DESIG    R.A.    EPOCH
         DATE        TIME   ALT       ΔU        ΔV        ΔW     TAG SENSOR

 7831    73.99    117.99   -.0000  75 045    J    128.02    920211
         920210  223448.82   910.      0.        8.      -4.  90220 395
         920210  223458.82   908.     -2.        8.      -6.  90220 395
         920210  223508.82   908.     -2.        8.      -6.  90220 395
         920210  223518.82   909.     -2.        8.      -5.  90220 395
         920210  223528.82   910.     -1.        8.      -4.  90220 395
         920210  223538.82   910.     -1.        8.      -4.  90220 395
         920210  223548.82   910.     -1.        7.      -4.  90220 395
         920210  223558.82   910.     -1.        7.      -3.  90220 395
         920210  223608.82   910.     -1.        6.      -3.  90220 395
         920210  223618.82   910.     -1.        6.      -3.  90220 395

13464    82.95    104.03   -.1067  81 053   FL    151.58    920210
         920211  064413.52   535.     -7.     -301.      -0.  13464 399
         920211  064650.14   533.     -7.     -303.      -0.  13464 399
         920211  174723.14   494.    -35.     -561.      -1.  13464 399

15206    26.91    921.56   0.0000  84 088    F    125.50    911209
         920210  200204.24 17259.     38.     1653.       6.  89207 221
         920210  200301.26 17326.     38.     1646.       4.  89207 221
         920210  200400.54 17396.     38.     1640.       3.  89207 221
         920210  200504.94 17471.     38.     1634.       0.  89207 221

16214     4.28   1431.15   0.0000  85 102    D     67.85    920210
         920211  120229.50 19311.      1.      -14.       8.  83999 222
         920211  120320.58 19331.      2.      -17.       9.  83999 222
         920211  120406.11 19311.      2.      -15.       9.  83999 222
         920211  120503.94 19311.      2.      -14.       9.  83999 222
         920211  120805.44 19311.      2.      -15.       9.  83999 222
         920211  120844.16 19311.      2.      -18.      10.  83999 222
         920211  121000.75 19310.      2.      -16.      10.  83999 222
         920211  121038.61 19310.      2.      -16.      10.  83999 222
         920211  121159.66 19310.      2.      -16.       9.  83999 222

20261    82.59    115.55   -.0002  89 080    A    203.88    920212
         920210  234322.80  1029.     -4.       -5.      -8.  90406 385
         920210  234342.89  1037.     -4.       -5.      -9.  90406 385
         920210  234352.93  1044.     -1.       -4.      -5.  90406 385
         920210  234402.98  1049.     -0.       -4.      -4.  90406 385

21538    46.70    608.03   -.4623  91 046    E    211.36    920128
         920203  113048.14   235.   -546.     1199.       1.  21538 387
         920203  113050.09   233.   -545.     1200.       1.  21538 387

21764    40.99    615.37   -.4851  91 074    F    241.06    920208
         920211  212636.05  4565.    147.      205.     -10.  21764 399
         920211  213727.27  5947.    140.      174.      -6.  21764 399

87117     3.90    199.68   -.0975  00 000    0    127.64    920208
         920211  000946.59  1539.    151.     -448.      -0.  94258 399
         920211  104520.79   706.   -229.     -601.       1.  94258 399
         920211  104551.42   744.   -231.     -597.       2.  87117 399
         920211  141607.67  1634.   -250.     -528.       1.  87117 399

88079    27.00    309.94   -.0067  00 000    0    185.20    920112
         920205  183534.10  2533.   -401.     -594.      -5.  88079 398
```

The source for the majority of these errors resides in the rule based portion of the system. Seven tracks were considered acceptable by the computer when in fact the expert had reasons to reject them. Rules governing the impact of tracks on each other and the effects of epoch age are incomplete or need adjustment. With only seven errors for analysis, it is difficult to recognize the broad trends needed to write good rules covering a large number of cases. Although additional rules could be added to the production system to cover the suspect tracks, such rules would probably not be general enough to be useful. A more sound approach is to seek more examples from the experts and use them as both a method for validating the present rules and a source of guidance for writing additional rules.

The second most frequent source of errors was from the evaluation function, which places too high a value on the sensor tag matching the current satellite identification number (the *Satellite ID* feature) and not enough emphasis on the magnitude of the ΔW cartesian error (the Δ*W RMS ERROR* feature). The discrepancies are subtle, with the problem tracks having ranks around 50%. Adjustment of the evaluation function through training on additional examples would probably correct these errors.

The cause of error in the remaining tracks is unknown. When the experts make a determination in these cases, they are using knowledge that has not yet been captured by the system. The only solution to this problem is continued knowledge engineering an effort to determine what additional factors are significant. It is notable that only two tracks fall into this category, a hopeful indication that only a limited amount of additional work with the experts is necessary.

VII. CONCLUSIONS

As indicated by the success of this research, a practical expert system for correlating UCTs is achievable. The code provided here could serve as the core of an implementation, however some weaknesses still need to be addressed. While the evaluation function is very general and complete, the rule base requires additional knowledge engineering before it can be useful. Notably, the current system does not adequately account for the expert's use of satellite drag, a significant shortcoming. In addition, rules for the synthesizer need to be written so that the tracks, once evaluated, can be fitted to the database. Finally, as with any real world system, a multitude of software engineering factors must be considered before deploying the program.

Despite these reservations, the application of artificial intelligence to this problem is a success. Other conclusions regarding the specific tools and techniques used in this research are discussed below.

A. HYBRID APPROACH

An emerging trend in artificial intelligence is the use of multiple paradigms within a single application. This is a natural outgrowth of the failure of any one approach to successfully handle all aspects of knowledge and reasoning. While symbolic computing brings deep reasoning capabilities and logic to the bear on a problem, it lacks flexibility when confronted with ill-defined domains. Connectionist systems excel when working with weakly linked propositions and vague associations between facts, but have no short term memory or reasoning capability to speak of. However, each approach can compensate for the weaknesses of the other so that a combination produces "the expressiveness and procedural versatility of symbolic systems with the fuzziness and adaptiveness of connectionist representations." (Minsky, 1991)

While a single model for encapsulating knowledge is conceptually easier to understand, at some point will breakdown in an attempt to fit information into its fixed view of the world. A hybrid approach that applies the paradigm that seems most appropriate stands a better chance of accurately representing real world problems.

B. EVALUATION FUNCTION

The evaluation function is extremely effective at eliminating boundary problems and fragility in the expert system. It also provides a certain amount of fuzziness to the system and "softens" some of the hard logic dictated by the production rules. It can deal with the multiple and weak connections between a feature set and a classification. This produces an immense savings in the number and complexity of rules needed for the rule base and uses a single algorithm to cover a large number of cases.

The inability of evaluation functions to process contextual and domain data outside the feature set was met with several approaches. Of these, mapping the features into fuzzy sets did an excellent job of linearizing the input to the neural network and improving the response of the resultant evaluation function. While they represent an interesting application, the functional links did more to confuse the implementation they were meant to clear up. The rule based production system is the most general method for accounting for conjunctive features and should be used in preference to functional links.

C. SYMBOLIC COMPUTING

The majority of errors coming out of the expert system can be traced to the rule set. This is not indicative of some fundamental fault of symbolic computing; rather, hard problems that could not be resolved through the preprocessing C code, fuzzy sets, or the evaluation function were simply passed on to the production system where they wait to be resolved. The current rule base is small and immature. With additions and modifications, it can be expanded to improve the fidelity of the overall system.

Knowledge of first principles was critical to development of sound rules. The information gained during the abbreviated knowledge engineering phase did not provide an adequate foundation for building either the production system or the evaluation function. Prior experience in orbital mechanics, dynamics, and differential equations proved critical.

D. MACHINE LEARNING

The use of machine learning was an unqualified success. In the form of the evaluation function, it produced a more general algorithm than would have been achieved through traditional knowledge engineering. The LVQ network produces a clean deliverable, in as much as the neural network itself can be disposed of and just the evaluation function retained. The LVQ network, along with the fuzzy sets, provides some meager support for explanation facilities since the relationships between input features and class membership is straight forward.

On the downside, getting a network trained and working properly can be difficult. Neuroengineering is still more of an art than a science with no clear paths to a solution. Since no a priori determination can be made as to whether a given network is capable of solving the problem at hand, much time can be expended with no results to show for it.

E. RANKINGS

The rankings of the individual tracks ultimately depends on the difference between two fuzzy set membership functions. There is little mathematical basis for this approach, other than it works. A more sound method would use rankings that are the conjunction of two sets, namely the subset of tracks that are members of *Acceptable* and not members of *Reject*. In fuzzy notation, the ranking would become

$$\mu_{GOOD} = \mu_{ACCEPT} \wedge \neg\mu_{REJECT}$$

Unfortunately, this membership function did not provide consistent results. It may be possible to change the membership functions for *Accept* and *Reject* in such a way as to make the above relationship valid. One possibility is to base membership on a non-linear function of the euclidean distance rather than on the distance itself. A function suggested by Kandel (1986, p. 23) is

$$\mu_{ACCEPT} = \frac{1}{e^{d}}$$

where
d : the euclidean distance
e : 2.7183...

This function was attempted without success. Some variation of it or an alternate mapping may prove fruitful.

F. FUTURE RESEARCH

1. Complete The Rule Base

Rules used to evaluate tracks need refinement to account for the few errors the system still produces. More examples from the experts may provide sufficient information to make the adjustments. A more challenging task is developing the rules that actually fit the selected tracks to the database. As previously stated, this requires access to the MANDC routine which implies that the work will have to be carried out on NAVSPASUR's own computer system. This is feasible, but presents some logistics problems.

2. Artificial Intelligence And The Brouwer Model

The expert system proposed here treats the symptom without curing the disease. The cause of most UCTs are deficiencies in the Brouwer-Lyddane algorithm itself. It may be possible to apply artificial intelligence techniques to the correlation and propagation algorithms directly, using an expert system to decide which algorithm and what degree of accuracy is suitable for a given track correlation. A customized solution could be used for each instance, starting with quick and easy attempts like Brouwer's and then graduating to more complex solutions if the correlation fails. Another consideration would be the use of ballistic coefficients. Many of the inaccuracies in NAVSPASUR's current implementation stem from the difficulty of predicting the effect of drag. Through the tracking of an object over several days, the ballistic coefficient could be found empirically by

$$\Delta P = -\frac{6\pi^2 \rho a^2}{vB}$$

$$B = \frac{m}{C_D A}$$

where
ΔP : change $\in$ satellite period (the satellite drag)
ρ : atmospheric density
a : semimajor axis
v : spacecraft speed
B : ballistic coefficient
m : satellitemass
C_D : coefficient of drag
A : satellite cross sectional area

An estimate for atmospheric density would be required. The ballistic coefficient could then be stored for use during future correlation attempts and, in its simplest form, could provide one more feature for the evaluation function to examine. Specifically, the larger the ballistic coefficient, the larger the ΔU and ΔV errors that would be tolerated. The ballistic coefficient may provide a more direct accounting of drag effects than is currently done using changes in satellite orbital period.

3. Alternate Knowledge Representations

In this thesis, symbolic processing was essentially combined with a neural network to build an expert system. This is by no means the only approach available, nor is there any indication that it is the best. Other alternatives include Baysian networks, case based reasoning, genetic algorithms, and different neural networks architectures. Confronting the same problem with different techniques would not only give more insight into the problem domain, but also provide a comparative analysis of the effectiveness of the various approaches.

4. Improving The Evaluation Function

It may be possible to extend to evaluation function to handle a larger feature set. Currently, the standard deviation of the three cartesian errors and relative age of a track as compared to the satellite element set are factors currently processed in the rule based portion of the system. Although efforts were made to account for these features in the evaluation function, the neural network was unable to produce any sort of correlation between the features and set membership. A correlation probably exists, but too few examples were available to the network to make a determination. Further training on an expanded set of examples may provide the needed information and extend the capabilities of the evaluation function.

5. Eliminating The Preprocessing Routines

Building tracks from individual observations takes place in the C code routine TRACKER.C. The assumption was that building tracks was a straight forward, numerical process that did not require the pattern matching and inference capabilities of CLIPS. This assumption was wrong since both heuristics and some amount of reasoning goes into the decision of what constitutes a track. Many of these rules could not conveniently be implemented in C code and consequently went unresolved. A portion of the rules in the CLIPS code exist only to compensate for this shortcoming and in some cases are almost redundant with the preprocessing code. A more consistent approach would eliminate the C code and perform all the track building and evaluation functions directly in C.

6. Implementation

The goal of any research is to see the results applied to a real world problem. The validation and verification of this expert system followed by its implementation at NAVSPASUR would be the culmination of this thesis.

APPENDIX A. BASICS OF ARTIFICIAL INTELLIGENCE

What follows is a primer of concepts and terminology used in the field of artificial intelligence. It provides a brief overview with more detailed information available in the references.

A. WHAT IS ARTIFICIAL INTELLIGENCE?

There is no strong agreement on what constitutes intelligence, consequently there is no clear definition of artificial intelligence (AI). While a proficient human chess player is considered intelligent, a thirty dollar chess playing machine from a department store is not. Conversely, a robot that could gather raw materials and replicate itself might be deemed smart, however most people do not endow earthworms with much intellect even though they routinely carry out this same function.

One definition given artificial intelligence is "the study of mental faculties through the use of computational models." (Charniak and McDermott, 1986) An alternate, proposed by Schank (1991) involves the idea of "building a machine that learns." Such a machine would acquire knowledge, evolve, and "get better over time." Covrigaru and Lindsay (1991) propose that intelligent systems are "autonomous" and goal oriented, seeking the means to achieve some ends. In their view, the chess playing computer is merely a problem solver while the reproductive robot might be intelligent. The lowly worm lies somewhere between the two.

In general, AI concerns itself with making machines do things that seem intelligent. In some respects, the ultimate goal of AI is to build a mechanical person, a goal far beyond current technology. Research in AI touches on several fields of study, all involving activities that are easy for people, but hard for computers, to carry out. Understanding spoken words (natural language interpretation), moving and manipulating objects (robotics), using common sense to figure out problems (inference), and computer vision are all areas currently being explored. Central to most problems in AI is capturing great amounts of information about the real world, storing in a convenient form, and then using some type of knowledge to interpret that data. Thus, a robotic vision system might use a television camera to take a picture of its surroundings and then "see" by using a set of algorithms that successively define lines, then build shapes from those lines, and ultimately use the shapes to recognize real world objects.

The AI field often uses specialized programming languages and tools. Traditional computer languages depend on a series of sequential steps that are carried out one at a time. Termed procedural, they use well defined algorithms and step by step programming to solve a problem. Fortran, Ada, and C are all procedural. While excellent for numerical work, they are poor at encapsulating human knowledge and emulating the way people think. On the other hand, AI languages are declarative. They emphasize writing several correct pieces of code (declaring what the program should do) and are less concerned with exactly how the pieces fit together. Lisp and Prolog are declarative languages. They work like a simulation, where "the programmer sets conditions on the behavior of the program, but doesn't know what will happen once the program starts." (Rowe, 1988)

Like a simulator, the outcome of the program is not always known in advance, nor is the final output always correct.

This brings up an important difference between AI and conventional languages. Conventional programs produce definite answers to definite questions. An Ada program that computes square roots will always produce a correct answer, assuming no errors in the code. Conversely, a Lisp program that decides whether to grant a loan to a business may not always give a correct solution. Indeed, in some cases there may not even be a right answer.

B. WHY USE ARTIFICIAL INTELLIGENCE?

Artificial intelligence is used when traditional computer programming techniques fail. The problems addressed by AI are complex with complicated data. Often, no mathematical solution exists for the problem or, if one does exist, it is too elaborate to be efficiently implemented on a computer. Consequently, AI programs often are used when non-numeric solutions are sought.

Because analytic solutions are usually not available, most AI programs use heuristics when trying to solve a problem. Heuristics are general guidelines, rules-of-thumb, and common sense ideas that direct the search for a correct solution. As an example, consider the problem of finding lost car keys. One heuristic might be to look in the kitchen. This may or may not be a good idea, depending on when you were last in the kitchen. A better heuristic would be to look in the last room you visited. Still a better idea would be to check your pockets first and, if the keys are not there, look in the last room you visited. Obviously, some heuristics are more useful than others, some may actually contradict each other, and none of them are guaranteed to produce results. AI programs handle heuristics adeptly and work well with problems that require them.

AI languages contain a rich set of features for treating information as an abstract object. The recently popular use of object oriented techniques (inheritance, encapsulation, polymorphism) in conventional programming languages has its roots in AI research. The use of frames, classes, and rules allows large amounts of data to be easily compared and modified. Consequently, artificial intelligence excels at problems involving pattern matching and finding similarities, differences, and trends in data.

Of the several AI concepts and tools available, the three principle ones used in this project are the expert systems, the neural network, and fuzzy logic.

C. EXPERT SYSTEMS

Expert systems are one of the more practical and commercially successful applications of artificial intelligence. An expert system "is a computer program that represents and reasons with knowledge of some specialized subject with a view to solving problems or giving advice." (Jackson, 1990, p. 3) The objective of an expert system is to capture in a computer program the knowledge and experience of an human authority. Once this knowledge has been encoded, the computer can be used to solve problems that previously required the skills of the human operator. One type of expert system attempts to replace the human expert with a machine. A well known example of this is Mycin, a program developed at Stanford in the 1970's to diagnose blood disorders. The program was quite successful as evidenced by a 1979 test in which the program actually out performed its human counterparts when recommending treatments (Jackson, 1990, p.

54). Other systems do not attempt to replace human experts, but instead work as an intelligent assistant that provides advice when asked. The Defense Advanced Research Project Agency (DARPA) is currently sponsoring work on Pilot's Assistant, an expert system for use in military jet aircraft to help make decisions when the pilot is disabled, distracted, or unable to interpret problems with his plane.

The key elements of an expert system are the problem domain, the knowledge base, and an inference engine. The problem domain is the input data that is provided to the expert system. It includes all the pertinent facts known about some problem over which the system has expertise. The knowledge base is a set of heuristics that can be used to find a solution to the problem. These heuristics take the form of rules that are used to guide the search. The inference engine does the actual work of finding a solution. Using one of several techniques, it applies the knowledge base to the problem domain until some sort of conclusion is reached. The problem domain represents facts about the problem, the knowledge base represents expertise that can help solve the problem, and the inference engine decides what knowledge to use on what facts and when to use it. Figure 19 shows the schematic for a typical expert system.

As an example, consider an expert system that helps choose an appropriate wine for dinner. Several factors must be considered, including the type of dish being served, the preferences of the individuals drinking the wine, and what wines are actually available. These concepts are stipulated in the following rules

```
IF the main dish has a sauce AND the sauce is sweet
THEN a sweet wine is recommended.

IF the main dish has meat in it AND it is a red meat
THEN recommend a red wine.

IF the dish is pasta
THEN recommend an Italian or French wine.

IF a red wine is recommended AND a sweet wine is recommended
THEN recommend pinot noir.

IF a red wine is recommended AND the guests do not like red wine
THEN recommend chardonnay.
```

These and other rules would constitute the knowledge base. A possible set of facts that could be given are

```
The main dish has red meat.
The main dish has a sweet sauce.
The guests prefer white wine.
```

Based on these rules and facts, the expert system would utilize it's inference engine to apply the facts to the knowledge and determine what to drink at dinner. Note that some

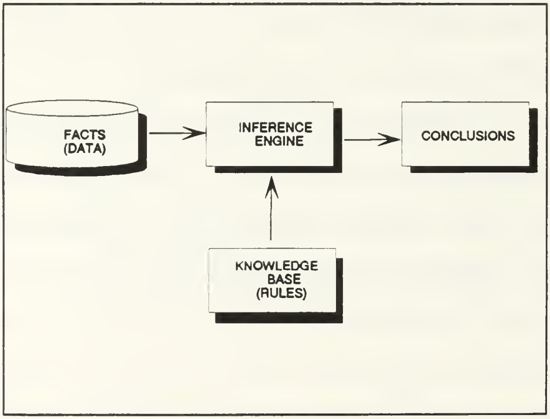


Figure 19. Typical Expert System

of the rules contradict each other and not all the facts are known for certain. The expert system will still reason despite these difficulties and, like the human counterpart, come up with a best solution based on what is known.

For obvious reasons, expert system are also called knowledge based systems. For less obvious reasons, they are also known as production systems. They form the basis for the research in this thesis.

D. ARTIFICIAL NEURAL NETWORKS

The brain is composed of neurons which interconnect through dendrils to form a network. This *natural* neural network is capable of complex pattern recognition, abstract reasoning, and learning. If the structure and mechanics of the neuron could be duplicated in an *artificial* neural network, then arguably some of the analytical power of the brain could be realized in an automata. This was the original motivation for research that today has evolved into the fields of massive parallel processing and neurocomputing. While practical neural networks have been built, there resemblance to natural neural networks is strictly topological; they lack the cognizance of a true brain and actually "incorporate features (that are) not neurobiologically possible." (Vemuri, 1988)

The architecture of neural networks involves layers of neurons. As shown in Figure 20, artificial neural networks are based on layers, with data being provided to an input layer and results produced at an output layer. Between the input and output are one or more hidden layers. Several schemes are used to interconnect the layers with Figure 20 showing the most common method of feed forward.

Figure 21 depicts an individual neuron. A unique weight is associated with each connection coming into a neuron and is used to scale each input. The total input, **I**, is the summation of all the weighted inputs and becomes the argument for the activation function, **a**. Biological neurons respond in a non-linear fashion to input and will not produce any output until some minimum threshold of stimulus is present. To mimic this behavior, artificial neurons can use non-linear activation functions with the sigmoid function being the most prevalent:

$$a(I)=\frac{1}{1+e^{-I*Gain}}$$

Other possible functions include signum, tanh, and even simple linear relationships. Based on the activation function, a single output value is generated and passed along all the

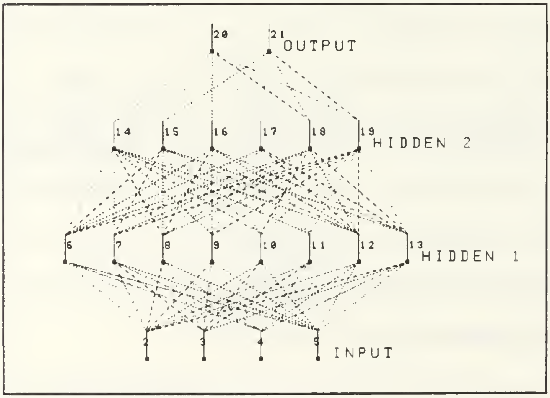


Figure 20. Example Neural Network

connections originating from the neuron. This output becomes part of the input to the next neural layer or, if there are no more layers, represents the final output of the entire system. Because of the activation function, artificial neural networks are non-linear and are theoretically capable of emulating any non-linear function.

As an example, two different architectures are presented in Figure 22 that solve the exclusive-or problem. This is a non-linear function since the output can not be represented by a simple linear combination of the input arguments. Weights are shown next to their respective connections. The numbers inside the individual neurons are a bias term that is added to the total input. Network **A** uses the standard sigmoid function for activation while **B** has an identity function. For **B**, the output is simply

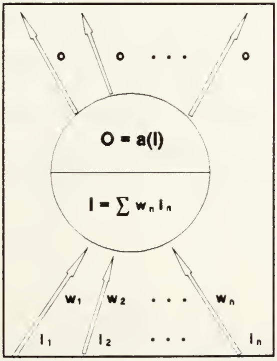
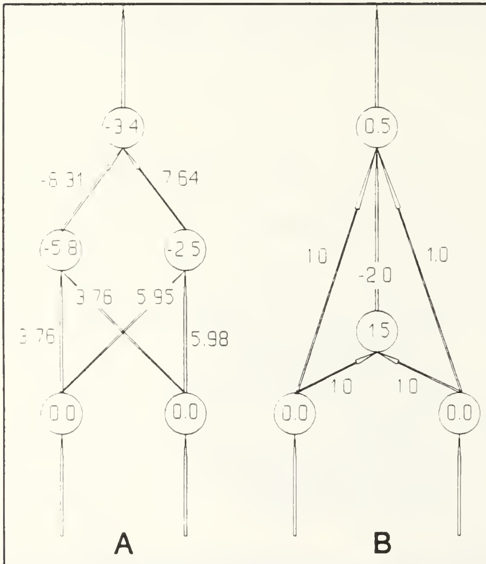


Figure 21. A Neuron

$$o_j = \sum_{j=1}^{n} i_j w_j + bias_j$$

Network **B** is more elegant and more accurate solution to the XOR problem than network **A** and highlights a problem with artificial neural nets. The efficiency of a network is a function of the number of nodes, the number of layers, and their interconnections. Unfortunately, there is currently little basis for deciding the type of topology to use for a given problem, so the selection of a structure, although crucial, is somewhat arbitrarily.

The knowledge possessed any network lies in the weights assigned to the connections between neurons. These weights must be either explicitly known and assigned



INPUT		OUTPUT	
		A	B
0	0	0.05	0.00
0	1	0.95	1.00
1	0	0.95	1.00
1	1	0.05	0.00

Figure 22. XOR Neural Network

to each connection or, more practically, learned by the network. In most cases, learning is based on the back-propagation algorithm, also known as the delta rule. Initially, weights are set randomly. Using back-propagation, actual input arguments are fed up the network while desired output is fed down. Along the way the error between actual and desired output is propagated backwards and used to make differential corrections to the weights. The process of presenting actual input versus desired output is repeated until the weights converge to steady state values. At this point the network is said to be "trained" and is ready for use. Training can be a time consuming process, however it is accomplished off line and consequently does not effect the real time operation of the network.

Neural networks have their strong points when applied to the correct class of problems. As shown above, they can model non-linear functions. They degrade gracefully in the face of incomplete or contradictory input data, producing a best fit as output. They work well in problems requiring pattern matching, correlation, and associative memory. However, artificial neural networks do have limitations. The difficulties with selecting a topology have already been outlined. Additionally, the choice of training method is critical, but again little guidance exists on selecting one. Training algorithms require a large number of examples for input and output data which often are not available in real world problems. Finally, they suffer from local minima since training is based on hill-climbing. Consequently, there is no guarantee of achieving an optimal solution with an artificial neural network.

E. FUZZY LOGIC

An area of interest to the artificial intelligence community is reasoning under uncertainty, the drawing of conclusions from facts and relationships that are not definite. Uncertainty can arise both from data, which can be inaccurate or incomplete, and casual relations, which may be weak in that a given set of evidence does not always guarantee an anticipated conclusion. Humans can be skillful at reasoning under uncertainty and several mechanisms have been proposed to provide automata with similar capabilities. One of the first and most well known systems is probability theory which uses Bayes law along with frequency or judgmental probabilities to determine the belief in a hypothesis, H, given a body of evidence, E. Baysian probabilities have several drawbacks that other systems have tried to address. The Dempster-Shafer theory uses hypothesis sets and belief functions to prevent nonsupportive evidence from automatically weighing against a given hypothesis (Shafer, 1976). Alternately, the employment of certainty factors attempts to limit the number of probabilities that must be computed and reduce the complexity of obtaining them (Neapolitan, 1989).

A shortcoming of the probablistic approaches it that they do not truly emulate human reasoning. Experts rarely think in terms of probabilities, but instead use ambiguous propositions and a "pantheon of inexact intuitions, hunches, suspicions, beliefs, estimates, guesses, and the like" (Kosko, 1992, p. 3). Quantities are defined relative to one another, such as being "more", "less", or "about the same" while subjective terms like "rarely", and "sort of" are prevalent. To deal with this vagueness, fuzzy logic was developed.

Fuzziness is "a type of imprecision that stems from a grouping of elements into classes that do not have sharply defined boundaries" (Kandel, 1986, p. 2). Such classes arise when dealing with objects, data, and relationships that are imprecise and unclear, i.e., real world systems. The goal of fuzzy logic is to provide a mathematical basis for reasoning with these vague, nebulous descriptions and drawing useful conclusions in the face of uncertainties.

The foundation for fuzzy logic is Zadeh's work in fuzzy set theory (Zadeh, 1965). Orthodox set theory is binary, or crisp, requiring elements to be either a member of the set or not a member. Fuzzy membership is continuous, allowing elements to be full members, nonmembers, or partial members of a set. For a given a group of elements **X**, the fuzzy set **A** is defined as

$$A = \{\ x,\ \mu_A(x)\ \} \qquad x \in X$$

$\mu_A(x)$ is termed "the grade of membership of x in A" and takes on a value from (0,1) to indicate a range from nonmembership to full membership. As an example, consider the group of tall people and the following heights:

$$X = \{4'6'',\ 5'0'',\ 5'6'',\ 6'0'',\ 6'6'',\ 7'0''\}$$

A traditional set would require some threshold, perhaps 6'0", and say any value above that threshold would be considered tall. The resulting set would then be

$$B = \{\ 6'0'',\ 6'6'',\ 7'0''\ \}$$

A fuzzy set would assign a subjective degree of membership to each element, resulting in a set composed of ordered pairs. Using fuzzy set notation, the results are

$$A = \{\ 5'0''/.2,\ 5'6''/.4,\ 6'0''/.8,\ 6'6''/.9,\ 7'0''/1.0\ \}$$

It is important to note that the degree of membership is not a probability. In the above example, the .8 associated with 6'0" does not mean that a person of height six feet has an eight in ten chance of being tall. Nor does it imply that 80% of the tall people are 6'0". Rather, it indicates that six feet conforms well with most people's idea of what defines tall. Relatively speaking, it conforms better than 5'6" but not as well as 6'6".

Central to fuzzy sets is the membership function, $\boldsymbol{\mu}_{\mathbf{A}}(\mathbf{x})$, which maps the elements from **X** into the fuzzy set. Membership functions can be discrete or continuous, linear or nonlinear. They are subjective and usually a mathematical formula can be developed to describe them. As another example, consider the problem of grouping points in euclidean space. Given a point, **a**, it is desirable to find the set of points, **b**, that are close to **a**. One membership function that might be used is

$$\mu_A(d) = \frac{1}{e^{d}}$$

where

$$d=[(x_a-x_b)^2 + (y_a-y_b)^2 + (z_a-z_b)^2]^{\frac{1}{2}}$$

Such a function is both continuous and nonlinear. The exact form taken by the membership function is dependent on both the elements to be mapped and the problem

$$\begin{aligned} A \cup B &= \textit{set union} \\ &= \min[\mu_A(x),\ \mu_B(x)] \end{aligned}$$

$$\begin{aligned} A \cap B &= \textit{set intersection} \\ &= \max[\mu_A(x),\ \mu_B(x)] \end{aligned}$$

being addressed.

Fuzzy set operators have been defined as

The mathematical justification for the minimum and maximum functions is provided by (Bellman and Giertz, 1973). In addition, a body of theory known as possibility theory has been developed to support reasoning using fuzzy sets.

Fuzzy logic provides a technique for representing imprecise knowledge and retains information that might be lost in a crisp representation. Some argue that fuzzy logic is simply a form of probability theory, an idea which may be true. However, when dealing with vagueness, fuzzy logic can provide a more natural method for emulating human reasoning than is currently realizable from Baysian methods.

APPENDIX B. BASICS OF ORBITAL MECHANICS

What follows is a primer of concepts and terminology used in the field of orbital mechanics. It provides a brief overview with more detailed information available in the references.

A. EQUATIONS OF MOTION

The motion of heavenly bodies in orbit is quite predictable. First observed empirically by Kepler in 1609, it was not until Newton's development of calculus that the governing equations of motion were available. Like any physical body, satellite motion is governed by three principles: the equations of motion, the conservation of angular momentum, and the conservation of energy. The resulting equations determine the shape of an orbit and a satellite's motion in that orbit.

1. Equations Of Motion

According to Newton, **F** = m**a**. For a satellite in orbit, this becomes

$$\begin{aligned}\vec{F} &= \vec{F}_g + \vec{F}_p \\ &= m\vec{a} \\ &= m\vec{r}''\end{aligned}$$

where
$\vec{F}_g$: *gravitational forces*
$\vec{F}_p$: *pertubation forces*
r: *distance between the two bodies*
M, m: *mass of each body*

The perturbation forces are the total of all non-gravitational forces acting on the body. Assuming they are negligible, motion is defined by

$$\vec{F}=\frac{GMm}{r^2}\frac{\vec{r}}{r}$$

where
G: *universal gravitational constant*

Several simplifying assumptions were made to achieve the above results. Specifically,

- Only two bodies are involved, influencing each other's motion
- Gravity is inversely proportional to distance
- The bodies are spherical and can be represented by a point mass
- Motion is measured in a Newtonian reference frame

In the case of no perturbation forces and substituting μ=GM, the equation becomes

$$\vec{r}'' + (\mu/r^3)\,\vec{r}=0$$

2. Conservaton Of Angular Momentum

Just as linear momentum is constant in the absence of external forces, angular momentum is constant in the absence of external torques. For the specific case of a satellite, this becomes

$$\frac{d\vec{h}}{dt}=\frac{d(\vec{r}\times\vec{v})}{dt}$$

$$=0$$

h: *angular momentum*
v: *instantaneous velocity of satellite*

3. Conservation Of Energy

Gravity fields are conservative such that "an object moving under the influence of gravity alone does not lose or gain mechanical energy, but only exchanges one form of energy, kinetic, for another form, potential." (Bate 1971) The motion of a satellite in orbit can be viewed as a continuous trade off of these two energies. When far from Earth, the object has much potential energy but little kinetic, so the resulting speed is low at that point in the orbit. As the satellite falls back down into gravity's well it accelerates, trading potential energy for kinetic and increasing its speed in the process. Always the total energy is constant. In mathematical terms

$$\xi = \frac{v^2}{2} - \frac{\mu}{r}$$

ξ: *specific energy (energy per unit mass)*

B. TYPES OF ORBITS

The simultaneous solution to the above three equations describes the orbital path of the satellite. The family of solutions is known collectively as the conic sections and the actual orbit must be a circle, an ellipse, a hyperbola, or a parabola. Examples of each are given below in Figure 23. The distance marked **a** is the semi-major axis, while **b** is the semi-minor axis. **p** is the semi-latus rectum. The eccentricity is **e**, and is equal to **c/a**.

What type of orbit a satellite assumes is dependent solely on the specific energy, ξ. The eccentricity is dependent on both the specific energy and the angular momentum of the satellite.

Objects in parabolic or hyperbolic orbits are aperiodic and are literally lost in space.

Of more interest to Earth orbiting objects are the circular and elliptical trajectories, shown in figure 24.

For circular and elliptical orbits, the period or time to complete one orbit is given by

$$\tau = \frac{2\pi a^{\frac{2}{3}}}{\sqrt{\mu}}$$

In the case of a circular orbit, **a** is simply the radius of the circle. Also for the circular orbit, the constant magnitude of the velocity is

$$V = \sqrt{\frac{\mu}{a}}$$

No simple expression exists for the velocity of an elliptical orbit since it varies as a function of position in the ellipse. Indeed, a closed form solution for position and velocity in an elliptical orbit does not exist, requiring iterative techniques to be used.

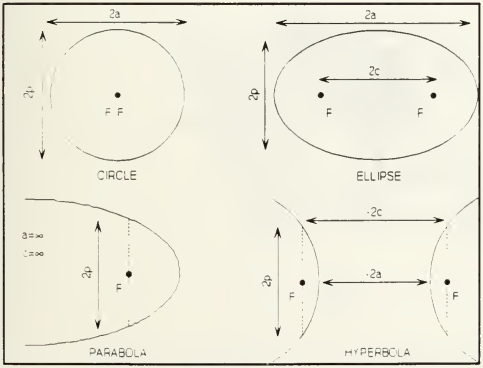


Figure 23. Conic Sections

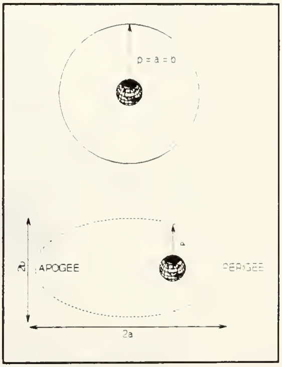


Figure 24. Earth Orbits

C. ORBITAL ELEMENTS

The parameters **a**, **b**, **p**, and **e** can be used to describe the shape of an orbit. To completely specify the position of a satellite, it is necessary to also know the orientation of the orbit relative to Earth and the position of the satellite in that orbit. This requires some sort of frame of reference of which several have been devised.

1. Coordinate Systems

One of the subtleties of the equations of motion is that they require an observer to be in a Newtonian, or inertially fixed, reference frame. An observer sitting on the surface of the Earth is not in not inertially fixed, since that person is spinning with the planet. Terrestrial latitude and longitude, although important for recording observations of celestial bodies, are useless for defining the position and motion of a satellite. Several alternate coordinate systems have been proposed, one of which is the geocentric inertial shown in Figure 25. Two axis of the system lie in the plane defined by

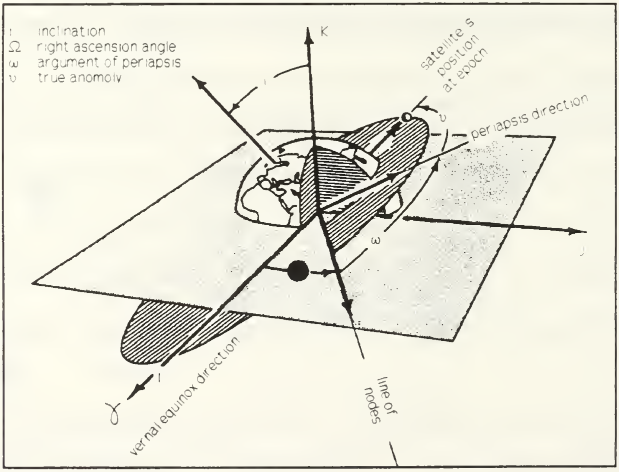


Figure 25. GCI Coordinate System

the Earth's equator with one of the axis pointing at the constellation Aries. The third axis is perpendicular and points to the north celestial pole. Origin is at the center of the Earth. The position of an object is given by its right ascension angle, $\mathbf{\Omega}$, and declination, δ. Declination is also known as inclination, **i**.

2. Classical Elements

A complete description of an heavenly bodies position and orbit is given by its orbital elements. Figure 25 outlines these elements. The shape of the orbit is given by **a** and **e**. Alternately, **a** can be replaced by the period since their relationship is mathematically fixed. The orientation of the orbit relative to Earth is given by $\mathbf{\Omega}$, right ascension, and $\boldsymbol{\omega}$, called the argument of periapsis. Finally, the position of the satellite is υ, the true anomaly or epoch. True anomaly may also be given as a time past some point in the orbit, such as how many minutes the satellite is beyond the perigee point. Based on these six elements, the position and motion of satellites is cataloged.

APPENDIX C. NAVSPASUR SID PRINTOUT

This appendix contains the printout produced by NAVSPASUR's SID program. It matches unknown and uncorrelated tracks to every satellite and computes the resulting ΔU, ΔV, and ΔW errors. It is the fundamental tool used to select tracks for manual fitting to the orbital database.

The first line lists the satellite that the program is currently matching to the observations. From left to right, the data fields are the NAVSPASUR catalog number, the inclination, the period, the decay rate, the international designation for the satellite, the right ascension angle, and the epoch of the element set. Units for each field are given in Table VI along with some sample values. Following the satellite data is one or more lines of observation data with units shown in Table VII. The epoch, both date and time,

TABLE VI. SATELLITE DATA

PARAMETER	UNITS	VALUE
INTERNATIONAL DESIGNATION	N/A	88 098 C
CATALOG NUMBER	N/A	20132
DECLINATION	DEGREES	4.07
PERIOD	MINUTES	440.34
RIGHT ASCENSION	DEGREES	333.63
DECAY RATE	MIN/DAY	-0.1590
ECCENTRICITY	N/A	0.00
EPOCH OF THE ELEMENT SET	YYMMDD	911222

is provided along with the measured altitude of the observed object. The next three columns are the cartesian errors that resulted in attempting to fit this particular observation to the satellite's current orbit. The NAVSPASUR programs utilize a least mean square algorithm for curve fitting and the resulting errors are presented in the orbital reference frame. Consequently, the columns give the ΔU, ΔV, and ΔW for the particular observation. The numbers listed are not actual distances, rather they are based on the partial derivatives of the observation with respect to the satellite's element set. As such they have no units.

The final two columns in the rows of observation data are the sensor tag which is the original satellite correlated with this observation by the sensor and the sensor's identification number.

This data was collected on 12 February 1992.

TABLE VII. OBSERVATION DATA
FROM SID

PARAMETER	UNITS	VALUE
EPOCH OF OBSERVATION	YYMMDD HHMMSS.HH	911222 000549.26
ALTITUDE	NM	1129
ΔU	N/A	-6
ΔV	N/A	-1
ΔW	N/A	-8
SENSOR TAG	N/A	90335
SENSOR	N/A	382

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SAT        INC   PERIOD      DRAG  INTL DESIG      R.A.     EPOCH
          DATE       TIME     ALT         ΔU        ΔV        ΔW        TAG     SENSOR


 11      32.87    122.86   -.0018  59 ALP    1     60.13    920211
        920209 120409.88    1410.       420.      -861.       11.     15390       398
        920114 202056.60     875.      -370.     -2129.      -21.     21692       398
        920114 202122.58     834.      -415.     -2099.      -10.     21692       398
        920211 120320.58    1492.       179.      1815.      -12.     83999       222
        920211 120406.11    1432.       160.      1625.       17.     83999       222

 12      32.90    127.18   -.0018  59 ALP    2    273.96    920211
        920131 192541.67     454.       105.       149.       13.     19881       398

 22      50.30     98.74   -.0008  59 IOT    1    229.16    920211
        920211 000827.75     304.      -266.       924.        2.     90000       329

 45      66.70    100.88   -.0003  60 ETA    1    191.08    920211
        920211 224415.30     473.      -348.     -1486.       13.     95291       393

 58      28.33    106.99   -.0000  66  NU    1     46.55    920211
        920206 050941.81     636.       108.      -151.       13.     15390       398

115      48.17     98.47   -.0008  60 BET    4    345.50    920211
        920211 144034.02     351.       -38.        54.        9.     83999       221
        920211 144053.94     385.        -3.         6.        6.     83999       221

133      67.14    102.41   -.0003  61 OMI   18    322.36    920211
        920211 092159.30     427.       -68.       -69.       15.     89376       232

152      66.60    102.66   -.0001  61 OMI   37     26.55    920211
        920211 061207.43     489.        30.       360.       -4.     93915       396

155      66.89    101.65   -.0009  61 OMI   40    161.78    920211
        920211 183000.53     406.       -86.      -706.       19.     95201       393

166      47.96     91.35   -.0526  61 RHO    3    176.15    920211
        920202 124852.63     171.      -354.      1489.        5.     88072       398

179      66.87    100.61   -.0073  61 OMI   52    236.43    920211
        920211 043719.26     444.      -173.     -1169.      -14.     86777       329

196      91.17    161.87   -.0000  61 SIG    4      2.06    920211
        920112 212622.32    1923.      -119.      1541.       23.     21538       398
        920115 003744.03    1954.      -476.      2504.       -5.     21538       745

223      66.89    103.79   -.0001  61 OMI   58    105.67    920211
        920211 100130.79     493.      -191.     -1090.       -4.     93938       396

229      48.29     97.60   -.0026  62 BET    4     23.22    920211
        920208 094403.72     384.        48.       166.       10.     15390       398

235      66.96    102.78   -.0002  61 OMI   66    188.17    920211
        920211 220213.80     500.      -168.     -1098.        7.     95293       393

263      66.54    101.06   -.0010  61 OMI   82    326.59    920211
        920211 053140.08     362.      -172.      -587.       -5.     18955       399

324      66.87    102.74   -.0003  61 OMI   97    111.32    920211
        920213 100130.79     493.      -169.      3128.      -11.     93938       396

341      44.79    157.55   -.0000  62 A-E    2    217.62    920211
        920207 120727.41    1207.      -215.       917.       22.     15390       398
        920211 003053.61     596.      -176.      1405.      -33.     90000       329

388      98.56     95.57   -.0056  62 A-O    4    191.39    920211
        920210 223052.30     330.        32.       -90.        2.     89405       242
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SAT      INC   PERIOD      DRAG  INTL DESIG     R.A.     EPOCH
        DATE       TIME     ALT         ΔU       ΔV       ΔW        TAG    SENSOR


447     50.13   107.57   -.0000  62 B-M   2    75.06    920211
        920211 122649.15    589.      -217.   -1348.       -3.    86680       329

548     66.69    99.74   -.0007  61 OMI 176    98.44    920211
        920211 031815.68    483.       -77.    -884.       15.    94687       399

558     65.70   112.23   -.0001  61 OMI 183   231.68    920211
        920211 113747.66    932.      -175.    1973.       13.    94719       399

560     67.17   108.44   -.0008  61 OMI 185    34.34    920211
        920211 104520.79    706.        69.    1011.       -1.    94258       399
        920211 104534.61    525.       -40.     657.      -13.    94257       399

649     66.27   114.13   -.0001  61 OMI 193   147.85    920209
        920211 050733.42    936.      -289.   -1643.       -9.    94698       399

655     67.26   110.64   -.0002  61 OMI 199   326.06    920211
        920211 091049.88    739.       102.     124.      -13.    89376       232

658     65.88   108.66   -.0003  61 OMI 202   216.29    920211
        920211 122504.49    600.      -184.     877.        6.    93957       396
        920211 122514.36    601.      -186.     883.      -20.    93957       396

700     30.48   107.95   -.0002  63 047   F    39.68    920211
        920211 080552.99    397.       -57.    -276.        2.    94707       399

702     87.33   166.36    .0000  63 014   H   307.69    920211
        920211 103545.78   1807.       -48.     253.      -26.    89832       231
        920211 103614.94   1818.       -32.     156.      -20.    89832       231
        920211 103641.84   1830.       -17.      66.      -15.    89832       231
        920211 103708.06   1844.        -2.     -21.      -11.    89832       231
        920211 103754.13   1874.        26.    -175.       -7.    89832       231
        920211 103822.07   1895.        44.    -269.       -6.    89832       231
        920211 103934.11   1958.        91.    -514.       -7.    89832       231
        920211 103954.72   1979.       106.    -585.       -8.    89832       231
        920211 104037.63   2025.       135.    -734.      -12.    89832       231
        920211 104059.94   2050.       150.    -812.      -15.    89832       231
        920211 104125.83   2081.       168.    -903.      -19.    89832       231
        920211 104155.42   2119.       188.   -1009.      -23.    89832       231

720     58.46   100.14   -.0002  63 054   C   253.13    920211
        920211 205718.99    459.       -25.    -527.      -19.    94000       396

738     46.41   194.78   -.0000  64 003   B    16.81    920211
        920210 225629.64   4194.      -379.   -2862.       -9.    89415       242
        920210 225706.13   4216.      -395.   -2945.        6.    89415       242
        920210 225738.49   4235.      -410.   -3019.       19.    89415       242

739     30.43   104.80   -.0005  63 047   H    37.37    920211
        920211 051429.24    534.       173.    -149.      -12.    89810       232
        920211 085524.11    490.       -98.    -671.      -17.    89336       232
        920211 085601.02    526.      -104.    -834.       15.    89336       232

750     60.83   140.87   -.0093  64 006   C   198.00    920211
        920210 230244.97   2090.        48.    2539.       -0.    89413       242
        920210 230314.40   2054.        43.    2419.      -14.    89413       242

956     89.77   105.77   -.0002  64 083   B   320.48    920211
        920207 161921.30    569.      -158.   -1210.       -0.    21538       384

967     89.77   105.78   -.0002  64 083   F   320.63    920231
        920207 161921.30    569.       -64.     815.        7.    21538       384
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 SAT        INC    PERIOD      DRAG  INTL DESIG     R.A.      EPOCH
            DATE      TIME      ALT         ΔU        ΔV        ΔW          TAG   SENSOR


 979     96.42    118.80   -.0003  65 004   B     12.37     920211
        920211 182608.23     406.       -49.      -539.       -5.       95201       393

1271     70.08    103.27   -.0001  65 016   A    213.40     920211
        920211 224415.30     473.       -16.        58.        6.       95291       393

1272     70.08    103.36   -.0000  65 016   H    229.34     920211
        920211 220213.80     500.      -171.      1187.       -8.       95283       393

1312     96.34    117.57   -.0002  65 004   C     74.35     920211
        920210 235934.85    1124.      -133.      2251.       15.       93877       396
        920211 015337.55     473.      -149.      -575.       -6.       94682       399

1347     56.01    102.21   -.0061  65 020   S     77.25     920211
        920211 123854.69     268.      -174.       437.        4.       94721       399

1370     56.07    102.62   -.0038  65 020  AC     67.33     920211
        920211 025141.64     465.       115.      -682.       -5.       93690       399

1377     98.15     97.34   -.0019  65 038   A    100.15     920211
        920211 081032.68     400.       -86.      1265.        5.       90000       329

1477     55.51    111.91   -.0008  65 020  BB    271.46     920211
        920205 025953.06     770.      -264.      2108.       -2.       15390       398

1576     34.23    127.07   -.0047  58 BET   3    237.30     920211
        920205 025047.47    1640.       214.      2010.      -14.       15390       398

1583     98.55    100.26   -.0005  65 072   0    304.11     920211
        920211 145023.30     360.       -72.      -838.       10.       94157       393

1588     56.06    116.65    .0000  65 073   E     53.32     920211
        920211 074256.45     878.      -418.     -2043.       -2.       93925       396

1589     56.05    110.80   -.0000  65 073   F    122.67     920211
        920211 174633.88     897.       -26.       367.       -3.       89415       241
        920211 174634.25     897.       -26.       358.        9.       89417       242
        920211 174701.55     890.       -26.       266.      -11.       89415       241
        920211 174711.38     889.       -25.       224.       -2.       89417       242
        920211 174726.68     890.       -21.       177.      -17.       89415       241
        920211 174738.50     892.       -17.       128.       -8.       89417       242
        920211 174808.02     905.        -2.        25.      -14.       89417       242

1613    144.24    118.03   -.0020  65 078   A    312.73     920211
        920207 072845.71     165.      -216.       499.       10.       15390       398

1716     32.19     99.58   -.0002  65 082  BX    104.96     920211
        920210 201818.77     398.        15.         7.       10.       82080       222

1778     34.26    107.53   -.0002  65 096   A    304.46     920212
        920127 005053.62     235.      -257.     -1137.        6.       88048       398

1806     79.82    120.10   -.0004  65 098   B    136.03     920211
        920211 064921.49     626.       152.       843.      -13.       93919       396
        920211 064931.36     627.       158.       836.      -21.       93919       396
        920211 065634.61     357.        49.      -473.       21.       18955       396
        920211 065644.48     357.        39.      -557.       19.       18955       396

1808     79.80    106.11   -.0077  65 098   D    138.06     920211
        920211 061511.19     566.       101.     -1110.      -10.       93915       390
        920211 171401.23     552.       102.       880.       14.       94742       399

1843     65.00     95.31   -.0020  65 106   A    162.61     920211
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 SAT       INC    PERIOD      DRAG  INTL DESIG     R.A.      EPOCH
           DATE       TIME     ALT          ΔU       ΔV        ΔW       TAG    SENSOR


         920211 212305.36      286.        -63.     -694.         5.    90000       329

1864     89.67    104.69   -.0001  65 109   A     19.52    920211
         920210 230710.23      575.         -1.       -5.        -8.    89413       242
         920210 230740.94      560.        -18.     -122.         1.    89413       242

1959     31.79     99.43   -.0004  65 062  00    354.81    920211
         920211 052011.96      441.         35.      361.        -4.    89324       232

2092     79.87    118.69   -.0012  65 098   H     89.82    920211
         920206 145927.72      876.        -36.      965.       -21.    88079       398

2153     79.76    118.36   -.0007  65 098   J       .40    920211
         920211 075717.88      279.       -302.     -259.         1.    90434       385

2167     82.37    112.74   -.0128  68 034   B    121.23    920211
         920211 091049.88      385.        -49.     1308.        -3.    89376       232
         920211 091113.51       329        -49.     1121.         8.    89376       232
         920211 091134.08       283        -55.      960.        17.    89376       232

2177     98.90    100.17   -.0004  66 026   0     13.55    920211
         920210 205651.27      306.       -227.     -475.        -9.    19994       399

2215     11.63   1334.48   0.0000  66 053   8    354.72    920204
         920211 084751.73    18292.         72.      733.         2.    89832       232
         920211 084813.75    18293.         72.      739.        -3.    89832       232
         920211 084836.37    18293.         73.      744.        -9.    89832       232
         920211 084857.67    18294.         73.      749.       -14.    89832       232

2222     12.11   1349.35   0.0000  66 053   J    356.17    920209
         920211 083534.22    18614.         97.     1045.        18.    90006       232
         920211 083818.91    18623.         99.     1094.       -23.    89832       232
         920211 083843.59    18624.         99.     1101.       -30.    89832       232
         920211 083904.72    18625.        100.     1107.       -35.    89832       232
         920211 083927.32    18626.        100.     1114.       -41.    89832       232

2226     89.05    106.87   -.0002  65 109   D     50.36    920211
         920211 195801.70      598.       -186.      988.        17.    86698       329

2337    144.23    105.11   -.0001  65 063   E    247.16    920211
         920211 094315.63      560.       -190.    -1295.       -14.    89370       232

2353     89.39    104.98   -.0002  65 109   2     85.38    920211
         920211 224222.40      473.        -67.      714.       -20.    95291       393

2361     87.29    166.26    .0001  63 014   L    300.84    920211
         920211 175147.94     2194.        324.     1276.         7.    89416       242

2362     86.49    165.15    .0003  63 014   M    177.32    920211
         920209 183745.81     1720.       -501.     -256.        -3.    21538       396

2367     86.07    164.27   -.0001  63 014   S     74.28    920211
         920206 143035.10     2210.        291.    -1332.         6.    15390       398

2435    100.92    114.58   -.0000  66 087   A    237.96    920211
         920211 113545.63      751.       -353.     1670.        11.    94719       399

2481     90.05    167.59    .0000  66 089   A    126.41    920211
         920213 103954.72     2035.         24.       75.       -23.    89832       231

2531     86.98    165.53   -.0008  63 014  AK    315.76    920210
         920211 085949.03     2058.       -258.     1140.       -27.    90000       951
         920211 090003.68     2056.       -251.     1094.       -22.    90000       951
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SAT         INC    PERIOD     DRAG  INTL DESIG     R.A.      EPOCH
            DATE      TIME     ALT          ΔU       ΔV        ΔW      TAG    SENSOR


          920211 090018.48    2054.      -244.     1347.      -16.   90000       951

2639      13.83   1436.38   0.0000  67 001   A    15.63    920208
          920211 083818.91   19217.       -90.     -718.       35.   89832       232
          920211 083843.59   19218.       -89.     -709.       25.   89832       232
          920211 083904.72   19218.       -88.     -701.       16.   89832       232
          920211 083927.32   19219.       -87.     -693.        6.   89832       232
          920211 084013.83   19221.       -85.     -677.      -14.   89832       232
          920211 084039.55   19221.       -84.     -667.      -25.   89832       232
          920211 084103.66   19222.       -83.     -659.      -35.   89832       232
          920211 084126.91   19223.       -82.     -650.      -45.   89832       232

2685      38.95    105.40   -.0023  67 014   F   349.47    920211
          920123 042117.61     695.       216.    -1010.      -17.   88893       398

2702      88.58    108.02   -.0002  66 076   D   213.96    920211
          920210 094148.35     603.      -182.     1059.        8.   15390       398

2777      90.27    103.34   -.0006  67 034   C   223.55    920211
          920208 120646.15     454.      -114.      865.       -8.   21538       398

2865      10.50   1313.60   0.0000  67 066   0    34.62    920210
          920211 041558.43   17889.        17.       40.       21.    2865       369
          920211 041645.61   17890.        17.       44.       26.    2865       369
          920211 042132.33   17892.        19.       49.       30.    2865       369
          920211 042255.56   17892.        19.       49.       29.    2865       369
          920211 042419.82   17892.        18.       55.       16.    2865       369
          920211 042543.79   17892.        19.       54.       21.    2865       369
          920211 042708.80   17893.        19.       57.       23.    2865       369
          920211 042832.11   17896.        22.       67.       38.    2865       369
          920211 042956.39   17897.        23.       66.       46.    2865       369
          920211 043121.74   17896.        22.       62.       45.    2865       369
          920211 043244.79   17896.        22.       60.       47.    2865       369
          920211 043409.22   17895.        21.       53.       43.    2865       369
          920211 043532.58   17895.        20.       47.       47.    2865       369
          920211 043656.04   17893.        18.       36.       38.    2865       369
          920211 043819.40   17894.        19.       37.       38.    2865       369
          920211 043942.48   17894.        18.       38.       30.    2865       369
          920211 044106.02   17894.        18.       39.       30.    2865       369
          920211 044229.97   17895.        19.       38.       35.    2865       369

2868      10.64   1319.09   0.0000  67 066   G    34.70    920210
          920211 041558.43   17889.     -1789.    -8260.       -8.    2865       369
          920211 041845.61   17890.     -1787.    -8254.       -4.    2865       369
          920211 042132.33   17892.     -1783.    -8247.       -0.    2865       369
          920211 042255.56   17892.     -1783.    -8245.       -2.    2865       369
          920211 042419.82   17892.     -1781.    -8238.      -15.    2865       369
          920211 042543.79   17892.     -1781.    -8238.      -11.    2865       369
          920211 042708.80   17893.     -1779.    -8234.       -9.    2865       369
          920211 042832.11   17896.     -1772.    -8224.        6.    2865       369
          920211 042956.39   17897.     -1772.    -8224.       13.    2865       369
          920211 043121.74   17896.     -1774.    -8225.       12.    2865       369
          920211 043244.79   17896.     -1774.    -8225.       14.    2865       369
          920211 043409.22   17895.     -1778.    -8230.       10.    2865       369
          920211 043532.58   17895.     -1781.    -8234.       14.    2865       369
          920211 043656.04   17893.     -1786.    -8241.        4.    2865       369
          920211 043819.40   17894.     -1785.    -8239.        3.    2865       369
          920211 043942.48   17894.     -1785.    -8237.       -4.    2865       369
          920211 044106.02   17894.     -1784.    -8234.       -5.    2865       369
          920211 044229.97   17895.     -1784.    -8234.       -0.    2865       369

2976     302.11    112.36   -.0000  67 036   C   121.32    920211
          920211 035954.40     706.      -126.      993.       10.   19185       396
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 SAT        INC    PERIOD     DRAG  INTL DESIG     R.A.      EPOCH
            DATE      TIME     ALT          ΔU       ΔV        ΔW         TAG     SENSOR


           920211 041012.56    705.       -233.   -1287.       11.      93902       396
           920211 041032.30    704.       -236.   -1291.      -17.      93902       396

2997       80.13   364.41   -.0002  63 014  AU    36.30    920211
           920210 210416.94   1656.        -18.     724.      -11.      89207       221

3093      105.79   112.21    .0001  68 002   A   123.08    920211
           920211 083930.42    609.       -262.     708.        1.      90000       329

3094      105.79   112.10   -.0000  68 002   B   147.63    920211
           920231 051618.88    792.        -94.   -1037.      -18.      94699       399

3173       99.97   198.84   -.0004  68 026   A   310.33    920211
           920211 122819.47    113.       -376.    -670.      -23.      94133       393

3174      100.00   207.21   -.0003  68 026   B   149.88    920211
           920211 144012.71   3853.        375.    1256.       18.      83999       221
           920211 144034.02   3849.        357.    1195.        7.      83999       221
           920211 144053.94   3845.        340.    1138.       -2.      83999       221
           920211 144114.03   3842.        323.    1081.      -12.      83999       221

3267       88.38   127.60   -.0004  63 014  CF    67.85    920211
           920205 121901.77   1863.        362.   -1755.      -13.      15390       398

3292       12.38  1363.68   0.0000  68 050   J      .03    920211
           920211 083534.22  18369.       -286.   -1873.       15.      90000       232
           920211 083818.91  18369.       -277.   -1824.      -31.      89832       232
           920211 083843.59  18369.       -276.   -1817.      -38.      89832       232
           920211 083904.72  18369.       -275.   -1810.      -43.      89832       232
           920211 083927.32  18369.       -274.   -1804.      -50.      89832       232

3343       80.54   104.02   -.0142  68 066   E    59.35    920211
           920211 111025.10    353.       -174.     546.       15.      94716       399
           920211 111646.93    644.         52.    -487.       11.      94717       399

3432       11.88  1419.24   0.0000  68 081   E    21.77    920209
           920211 091752.36  19458.         99.    4201.      -38.      89832       232
           920211 091818.53  19458.         98.    4209.       49.      89832       232

3462       32.03    97.49   -.0007  65 062  PT   333.92    920211
           920211 074001.84    370.         37.     -87.       -8.      89324       232

3492       30.48    99.79   -.0064  65 082  QN    24.47    920211
           920211 083244.24    457.        171.     179.      -17.      89336       232

3509       62.38   105.64   -.0031  68 091   F   235.31    920211
           920121 101515.05    617.       -262.    1447.      -15.       3899       329

3551       62.30   108.19   -.0029  68 097   D   287.86    920211
           920211 184313.72    551.        253.     115.        2       93983       396

3553       62.27   104.06   -.0095  68 097   F   215.16    920231
           920211 195236.22    756.       -245.    2198.      -10.      19111       396

3555       62.32   110.74   -.0001  68 097   H   223.80    920211
           920122 023456.12    346.       -399.    1451.       -8.      87302       396
           920211 002701.70    261.       -369.    1487.       17.      86651       329
           920211 003102.63    453.         81.     157.       -9.      90000       329
           920211 111558.36    638.        195.     870.      -17.      94717       399

3558       62.21   104.32   -.0025  68 097   L   203.45    920211
           920211 201457.39    359.       -350.    -913.       11.      86762       329
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SAT          INC   PERIOD      DRAG  INTL DESIG      R.A.     EPOCH
             DATE        TIME    ALT         ΔU        ΔV        ΔW       TAG    SENSOR


3560       62.28    101.80   -.0117  68 097   N    239.99    920211
           920211 135429.55    448.       -112.     -199.       11.    80069       399

3569       62.32    107.92   -.0040  68 097   V    306.08    920211
           920211 075205.23    701.        155.      264.        5.    89376       232
           920211 075226.91    667.        117.      183.      -10.    89376       232

3592       90.09    106.12   -.0002  65 048   F    254.85    920211
           920211 122444.75    600.         37.     -312.       13.    93957       396

3670       88.41    126.78   -.0001  69 009   8     84.61    920211
           920208 132630.42    746.        369.     -258.       18.    88079       398

3681       62.12     95.16   -.0275  68 091  AG     56.51    920211
           920211 061501.05    283.        -19.     -128.      -16.    87329       396

3699       62.33    105.10   -.0063  68 091  AN     29.65    920211
           920211 131148.50    254.       -202.     -562.       17.    94145       393

3713       62.22    112.73   -.0018  68 097  AQ    216.31    920211
           920211 100951.00    685.       -226.     1645.      -14.    94714       399

3741       29.90    104.09   -.0016  63 047   L     70.23    920211
           920211 011447.48    483.       -213.      522.       18.    94679       399

3748       67.75    112.97   -.0005  61 OMI 220    309.31    920211
           920211 041004.20    500.       -400.      446.        3.     5599       399
           920211 095328.07    940.         10.     -374.      -10.    89832       232
           920211 095352.86    960.         18.     -466.        4.    89832       232
           920211 095416.79    982.         27.     -556.       -3.    89832       232

3749       56.14    107.42   -.0017  65 020  EU    275.84    920211
           920131 052028.33    445.        105.      159.        6.    88788       398
           920211 040254.32    679.         57.      203.       -4.    86778       329

3758       62.26    113.96   -.0010  68 091  AV     65.13    920211
           920211 144256.24    977.       -327.     1313.        2.    90236       383

3783       62.40    103.29   -.0046  68 097  AV    265.03    920211
           920211 051401.39    587.        -86.      115.       17.    89810       232

3784       62.24    111.22   -.0020  68 097  AW     74.94    920211
           920211 153935.33    458.        -41.     -864.       -5.    86767       329
           920211 121422.99    537.       -249.     -910.        3.    93329       399

3790       63.01    109.73   -.0019  68 091  AX    349.27    920211
           920203 220536.85    296.       -292.      884.      -13.    19994       399
           920204 215632.71    299.       -263.      -94.      -16.    19994       399

3794       62.27    112.17   -.0013  68 091  BB    134.75    920211
           920211 100004.44    588.        -10.      220.       -5.    93937       396

3811      101.98    112.86    .0000  68 114   C    265.80    920211
           920211 191315.07    780.        -33.     -787.      -10.    95222       393

3818       73.99    106.29    .0000  69 024   A     76.67    920211
           920205 130741.94    649.          6.      236.      -10.    88079       398

3825      104.74    151.60   -.0007  69 025   C    106.01    920211
           920211 091818.53   2651.          6.      820.        6.    89832       232
           920231 091839.88   2637.         12.      754.      -10.    89832       232

3843       62.27    113.30   -.0023  68 097  BG     34.73    920211
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 SAT       INC    PERIOD      DRAG  INTL DESIG     R.A.      EPOCH
          DATE        TIME      ALT        ΔU        ΔV        ΔW       TAG    SENSOR


        920211 085915.18     1074.     -141.     1218.       -6.    94711       399

3874    62.28     112.47    -.0009  68 091  BH    210.28    920209
        920211 102022.85      695.     -301.     2120.       -0.    94491       399

3899    62.22     105.60    -.0026  68 097  BL     64.42    920112
        920116 052633.12      700.      -87.     -344.        4.     3899       396
        920121 101515.05      617.     -182.      658.       -4.     3899       329
        920126 083727.69      630.      -51.      528.       -2.     3899       743

3908    63.37     108.38    -.0008  68 091  BL    189.97    920211
        920210 211939.45      606.     -133.     -137.        0.    89298       221

3912    62.27     114.47    -.0004  68 091  BO    214.49    920211
        920211 195226.35      756.     -404.     -868.       -9.    19111       396

3932    65.60     109.19    -.0001  61 OMI 223      4.19    920211
        920211 064931.36      627.     -208.      760.       11.    93919       396

3938    63.03     117.21    -.0011  68 097  BS     19.08    920211
        920211 080733.76      523.       81.      814.        8.    94707       399

3974   102.06     114.93    -.0000  68 069   E    186.63    920211
        920211 131155.08      797.      -46.     -703.        7.    90062       395

4008    62.87     106.84    -.0023  68 091  BY    259.96    920211
        920211 052307.17      398.      115.      171.       18.    89812       232
        920211 052331.74      348.       60.       90.      -9.0    89812       232
        920211 052523.17      299.       -6.     -349.      -18.    89812       232
        920211 052546.95      333.       14.     -469.       11.    89812       232

4053    30.32     123.77    -.0067  69 064   C     99.90    920211
        920211 103545.78      865.     -302.     -755.       -4.    89832       231
        920211 103614.94      885.     -322.     -861.       -7.    89832       231
        920211 103641.84      907.     -340.     -962.      -10.    89832       231
        920211 103708.06      933.     -356.    -1063.      -12.    89832       231
        920211 103754.13      986.     -383.    -1248.      -16.    89832       231
        920211 103822.07     1022.     -399.    -1363.      -18.    89832       231

4119    81.21      95.61    -.0015  69 084   A     52.79    920211
        920211 064813.17      301.       10.     -139.      -13.    89871       231

4141    69.90     100.28    -.0006  69 082  AJ     10.05    920211
        920211 080648.38      464.       -3.      696.       13.    94707       399

4158    70.00     102.30    -.0001  69 082  AA    231.27    920211
        920208 132305.70      476.     -117.    -1035.        3.    88079       398

4178    69.85     101.69    -.0005  69 082  AW    158.96    920211
        920211 182853.30      406.     -172.     -616.       16.    95201       393

4191    70.51     100.22    -.0023  69 082  BE    109.64    920211
        920211 091839.88      428.      -20.     -427.      -13.    89832       232

4193    69.95     103.87    -.0016  69 082  BG    273.25    920211
        920211 011415.85      464.      -46.      515.       -6.    94679       399

4201    70.01      99.25    -.0024  69 082  BQ     91.81    920211
        920211 185325.93      391.     -232.     1382.        1.    95217       393

4231    70.29     101.18    -.0015  69 082  CN    284.73    920211
        920211 065701.25      447.       25.       16.      -14.    89324       232
        920211 064713.93      436.     -211.    -1293.       -6.    93035       393
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SAT       INC    PERIOD     DRAG  INTL DESIG     R.A.    EPOCH
          DATE        TIME    ALT         ΔU       ΔV       ΔW       TAG   SENSOR


4237     70.01    103.30   -.0000  69 082   E   216.00   920211
         920211 035432.62    522.     -271.    1500.      -5.     86607       329

4327     99.16    106.06   -.0000  70 009   A   204.90   920211
         920210 232803.48    565.       -9.     280.       3.     89413       242

4330     31.06    115.99   -.0084  70 011   A    78.34   920211
         920211 113648.71   1001.      339.     523.     -12.     90447       385
         920211 031423.87    794.       93.    1236.      -7.     94567       399
         920211 051844.38    850.       34.    2078.      -2.     94699       399
         920211 113507.79    098.      120.    -373.      -3.     94719       399

4382     66.43    111.76   -.0005  70 034   A   294.84   920211
         920210 235934.85   1124.     -326.    1563.      -8.     93877       396

4384     74.03    116.22    .0000  70 036   B   193.12   920211
         920211 191140.42    784.      -72.    -744.       8.     95222       393

4421     62.78    109.85   -.0028  66 097  CF    65.05   920211
         920211 144256.24    977.      120.    1148.       8.     90236       383

4515     90.06    106.84   -.0001  70 067   3   326.53   920211
         920211 061147.69    490.      -83.     336.     -19.     93915       396
         920211 061157.56    490.      -79.     259.      -9.     93915       396
         920211 061207.43    489.      -75.     183.       2.     93915       396
         920211 061217.30    489.      -73.     107.      12.     93915       396

4594     62.97    107.19   -.0041  70 089   A   292.68   920211
         920211 064807.63    583.      -66.    -547.      12.     90000       329
         920211 012805.72    277.     -360.     206.     -15.     93888       396

4612     99.78    103.89   -.0003  70 025   0   219.00   920211
         920210 211936.45    486.       18.       4.     -12.     89298       221

4613     99.07    103.42   -.0019  70 025   R   115.46   920211
         920211 031835.67    493.      -58.     -70.      14.     94687       399

4637     99.78    105.98   -.0001  70 025   V   170.83   920211
         920211 061511.19    566.       -0.       1.      -0.     93915       396

4642     99.94    103.79   -.0033  70 025  AA   195.38   920211
         920210 225040.46    499.      -15.      86.      14.     89416       242
         920210 225117.77    530.       16.     -56.       3.     89416       242

4647     99.91     98.64   -.0049  70 025  AF   297.09   920211
         920211 172952.42    324.       -3.     -11.     -12.     90003       241
         920211 173019.24    316.      -13.    -120.      -5.     90000       241

4654    100.03    104.31   -.0006  70 025  AN   359.25   920211
         920211 100130.79    493.     -205.   -1147.      -3.     93938       396

4664     02.76    104.76   -.0045  70 091   R    58.09   920211
         920213 131155.08    797.       -7.    1392.       5.     90062       395

4698     63.11    109.40   -.0034  70 089   0   311.45   920211
         920211 064807.63    583.       49.    1220.     -11.     90000       329

4738    100.14    104.30   -.0004  70 025  CM    78.31   920211
         920211 051116.85    495.       -2.      27.     -12.     89810       232

4744    100.17    106.45   -.0001  70 025  CT    23.88   920211
         920210 202051.21    578.      -10.     284.       8.     89207       221
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SAT       INC   PERIOD     DRAG  INTL DESIG    R.A.     EPOCH
          DATE     TIME     ALT          ΔU      ΔV       ΔW       TAG     SENSOR


4759     99.94   105.76   -.0004  70 025  OH   134.80   920211
         920207 161921.30   569.     -158.   -1160.      16.     21538       384

4820     99.71   104.79   -.0020  70 025  EB   319.73   920211
         920211 171425.97   520.     -245.    1322.     -10.     94742       399

4841    120.78   155.30   -.0002  68 055   O   262.56   920211
         920211 073846.40  1662.      268.     382.      17.     89324       232

4856     99.71   102.91   -.0004  70 025  EL   125.82   920211
         920124 052920.50   515.       39.     316.      11.     12102       385

4857     99.79   103.58   -.0016  70 025  EM   215.34   920231
         920210 094052.78   535.     -265.   -1525.     -19.     15390       398

4862     99.62   100.12   -.0081  70 025  ES   171.88   920211
         920211 081128.50   377.     -185.   -1060.      -9.     90000       329

4863     99.75   102.43   -.0026  70 025  ET   244.76   920211
         920211 191058.55   482.      -91.    -918.      -3.     95223       393

4869     99.97    98.13   -.0051  70 025  EZ    13.20   920211
         920210 093716.01   316.     -110.     918.      -5.     15390       398

4881     11.93  1456.87    .0003  71 006   A    45.26   920205
         920210 223052.30 19525.     -390.    4234.      38.     89405       242
         920210 223123.74 19525.     -390.    4234.      45.     89405       242
         920210 225947.88 19541.      -32.    1524.     -12.     89413       242
         920210 230020.69 19541.      -32.    1524.      -8.     89413       242
         920210 230113.87 19541.      -33.    1524.      -2.     89413       242
         920210 230142.26 19541.      -33.    3525.       2.     89413       242
         920210 230244.97 19541.      -33.    1525.       9.     89413       242
         920210 230314.40 19540.      -33.    1525.      13.     89413       242
         920210 230347.57 19540.      -33.    1525.      17.     89413       242
         920210 230431.24 19540.      -33.    1525.      22.     89413       242
         920210 230559.01 19540.      -34.    1525.      33.     89413       242
         920210 230640.35 19540.      -34.    1526.      38.     89413       242
         920210 230710.23 19540.      -34.    1525.      41.     89413       242
         920210 230740.94 19540.      -34.    1526.      45.     89413       242

4942     63.08   111.94   -.0014  70 091  AK   193.62   920211
         920211 203747.63   362.       12.     -13.     -12.      4942       399

4964     65.72   113.20   -.0001  71 015   A    64.40   920211
         920210 223456.82   908.     -129.    -558.      -8.     90220       395

4969     99.63    98.73   -.0119  70 025  OP   159.73   920211
         920211 081128.50   377.      -36.    -488.       5.     90000       329

4976     99.67   101.24   -.0057  70 025  GW    15.83   920211
         920213 182730.53   406.      -86.     523.      18.     95201       393

4981     99.89   100.60   -.0075  70 025  HB    31.48   920231
         920211 182853.30   406.      -43.    -507.       3.     95201       393

5010     85.88   110.35   -.0020  71 015   O   145.34   920211
         920211 224607.33   473.      -80.      -1.      11.     95291       393

5013     65.00   111.83   -.0030  71 015   G   158.22   920211
         920211 212305.36   286.     -229.   -1155.     -18.     90000       329

5014     65.62   109.20   -.0028  71 015   H   356.59   920211
         920211 204343.29   697.      -76.     371.      16.     93455       399
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SAT       INC   PERIOD     DRAG  INTL DESIG     R.A.  EPOCH
        DATE      TIME     ALT          ΔU        ΔV   ΔW       TAG  SENSOR

5015    65.73   109.54   -.0013  71 015   J   344.75  920211
      920211 122649.15    589.         204.    -691.      4.   86660    329

5042    65.66   110.40   -.0024  71 015   P   178.59  920211
      920128 232902.17    904.        -116.    -154.     -2.   38892    398

5076    62.80   112.73   -.0003  70 089  AP   250.33  920210
      920209 151846.06   1040.        -207.     959.     -7.   88079    398
      920211 015337.55    473.        -103.     600.     17.   94682    399

5093    62.73   101.01   -.0124  70 091  AQ   288.21  920211
      920211 184313.72    551.         244.    -457.    -19.   93983    396

5095    05.53    96.07   -.0450  71 015   V   192.94  920211
      920211 212305.36    286.        -215.    1378.    -13.   90000    329

5144    65.74   108.57   -.0029  71 015  AO   298.89  920211
      920211 073428.79    801.         166.   -1445.     -0.   89376    232

5148    99.70   101.92   -.0033  70 025  JR   289.69  920211
      920211 224758.63    474.         -44.     615.     13.   95291    393

5192    65.60   106.20   -.0012  71 015  AP   318.87  920211
      920211 171451.74    489.        -323.     347.      1.   94742    399

5197    65.60   110.72   -.0035  71 015  AT   287.27  920211
      920211 031524.53    899.        -170.    1411.     11.   94567    399

5242    82.70    97.35   -.0146  70 069  BO   198.19  920211
      920210 230113.87    372.          80.     374.      4.   89413    242
      920210 230142.26    307.          28.     238.    -10.   89413    242

5281    73.98   100.49   -.0046  71 052   A   351.20  920211
      920209 072430.52    168.         -97.    -705.     -7.   15390    398
      920211 205718.99    459.          44.    -145.      5.   94000    396

5322    61.30   111.75   -.0023  08 097  CJ   233.49  920211
      920210 235311.41    607.        -393.   -2376.     -6.   88075    399

5349    99.77   105.69   -.0101  70 025  KN   177.73  920211
      920211 083930.42    609.          45.     403.      2.   90000    329

5350    99.72   102.29   -.0028  70 025  KP   304.48  920211
      920211 194610.19    423.        -261.    1212.    -13.   86622    329

5417    62.82   102.90   -.0048  68 097  CL   202.02  920211
      920210 094148.35    603.        -116.     941.      9.   15390    398

5435    50.15    99.75   -.0007  71 071   A    72.79  920211
      920211 011328.18    418.        -196.   -1239.      5.   94679    399

5446   100.41   106.73   -.0003  70 025  LE   314.42  920211
      920211 212322.30    623.        -179.    1226.     16.   90000    329

5498    32.03   111.82   -.0000  71 080   B   264.11  920211
      920211 174940.71    981.         192.     601.     13.   89415    241
      920211 175001.63    942.         160.     512.      9.   89416    242
      920211 175006.70    933.         151.     505.     13.   89415    241
      920211 175039.33    681.         104.     386.      8.   89415    241
      920211 175040.69    879.         103.     370.      3.   89416    242
      920211 175147.94    803.          26.     133.     -0.   89418    242
      920211 175257.00    778.         -12.    -110.      6.   39416    242
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 SAT       INC   PERIOD     DRAG  INTL DESIG    R.A.     EPOCH
          DATE     TIME     ALT        ΔU        ΔV       ΔW        TAG    SENSOR


5531     66.68   102.19   -.0008  71 015  BV   236.52   920211
         920211 220345.70   494.      -86.     -873.       -9.   95283       393

5581     82.05   104.72   -.0004  71 093   B   284.41   920211
         920211 073057.02   472.      -17.     -166.       -6.   89810       232
         920211 073121.06   476.      -13.     -263.        1.   89810       232
         920211 073142.81   489.       -2.     -354.       13.   89810       232

5638     62.50   103.82   -.0048  70 089  CJ   158.24   920211
         920211 224607.33   473.      -24.      112.       12.   95291       393

5685     74.03   104.67   -.0000  71 111   B   179.07   920211
         920211 080758.15   557.     -175.    -1273.      -14.   94707       399

5760     65.63    91.61   -.5215  71 015  CC   236.40   920210
         920211 040413.99   171.        7.      -27.       -7.   90009       329

5761     65.84   100.64   -.0135  71 015  CD   347.82   920211
         920203 220536.66   296.     -195.     1297.       -7.   19994       399

5763     66.97   109.93   -.0011  71 015  CF   226.95   920211
         920211 113545.63   751.      -86.    -1706.       -9.   94719       399
         920211 224607.33   473.      -84.     -631.       12.   95291       390

5795     62.90   104.74   -.0068  70 089  CL    26.85   920211
         920211 061511.19   566.      249.      333.       -1.   93915       396
         920211 131148.50   254.      -30.       19.        1.   94145       393

5824     97.88   109.58   -.0018  70 025  MJ    32.44   920211
         920211 191146.42   784.      277.       79.        2.   95222       393

5994     84.96   170.98   -.0062  63 014  DA    37.03   920211
         920129 235327.88  1162.      216.     1505.       21.   88788       398

6058     26.22   650.26    .0010  72 041   B   153.23   920211
         920211 180652.43  1026.        4.      -23.       -0.   90244       382

6085     62.78   102.03   -.0028  70 089  CT   275.57   920211
         920211 003625.65   644.     -337.    -1780.        1.   90000       329
         920211 060132.72   628.        3.       77.       17.   89376       232
         920211 060157.17   614.      -10.      -12.       10.   89376       232
         920211 060335.96   622.        4.       14.      -10.   89810       232
         920211 060356.07   635.       17.      -59.        3.   89810       232

6118     74.03   114.32   -.0000  72 057   B   272.41   920211
         920211 015828.34   832.       26.      -83.      -21.   94682       399

6278      9.96  1457.10   -.0009  72 090   A    52.60   920211
         920210 223052.30 19559.       -4.    -1138.      -26.   89405       242
         920210 223123.74 19558.       -4.    -1137.      -22.   89405       242
         920210 223157.03 19558.       -4.    -1136.      -18.   89405       242
         920210 223225.69 19558.       -4.    -1136.      -14.   89405       242
         920210 223358.66 19557.       -5.    -1334.       -3.   89407       242
         920210 223430.21 19557.       -5.    -1134.        2.   89407       242
         920210 223458.74 19556.       -5.    -1133.        5.   89407       242
         920210 223607.20 19556.       -5.    -1332.       14.   89407       242
         920210 231048.99 19566.     -286.    -3855.      -49.   89413       242
         920210 232656.94 19563.     -287.    -3847.       -1.   89413       242
         920210 232721.32 19563.     -287.    -3847.        0.   89413       242
         920210 232742.25 19563.     -287.    -3847.        2.   89413       242
         920210 232803.48 19563.     -287.    -3847.        3.   89413       242

6306     99.63   111.79   -.0001  72 097   B   305.23   920211
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SAT        INC    PERIOD      DRAG  INTL DESIG     R.A.     EPOCH
           DATE        TIME    ALT         ΔU       ΔV        ΔW        TAG    SENSOR


         920113 055423.13      706.        10.     -564.      20.     12102       399
         920113 055509.31      706.       -59.     -918.     -14.     12102       399

6675     74.02     114.61   -.0000  73 037   A   322.80    920231
         920211 092047.21      733.       -24.      -43.     -12.     89376       232

6676     74.02     115.31   -.0000  73 037   B    92.72    920211
         920211 084307.59      824.      -169.     1323.     -18.     89336       232

6681     74.02     113.99    .0000  73 037   G   203.72    920211
         920206 095345.03      700.      -117.     -875.       7.     15390       398

6752     62.29     112.57   -.0015  68 091  CJ   240.58    920211
         920211 135429.55      448.       -92.      335.     -17.     80069       399
         920211 175606.24      404.      -414.      356.     -11.     93974       396

6779     28.03     656.29   0.0000  67 001   X    83.07    920210
         920207 072808.50      167.      -238.      521.      -6.     15390       398
         920207 072826.65      166.      -243.      522.     -15.     15390       398
         920207 072845.71      165.      -250.      523.     -25.     15390       398
         920207 072904.82      166.      -256.      525.     -35.     15390       398
         920207 072924.02      167.      -263.      527.     -44.     15390       398
         920211 094655.26     1041.       413.      490.      36.     89832       233
         920211 095352.86      663.        33.    -1463.     -47.     89832       232
         920211 095416.79      749.        37.    -1675.     -45.     89832       232
         920211 095438.82      831.        32.    -1873.     -43.     89832       232

6826     74.02     113.41    .0000  73 064   B   103.15    920211
         920211 090126.29      758.         0.       13.       6.     89832       232
         920211 090146.90      745.       -14.      -61.      -9.     89832       232

6828     82.94     104.77   -.0000  73 065   A    96.22    920211
         920211 073559.85      541.      -175.     1193.     -12.     89812       232
         920211 073620.29      502.      -180.     1072.     -14.     89812       232

6843     65.69     107.50   -.0028  71 015  CK    38.26    920211
         920208 120547.77      544.       111.      184.      -8.     21538       398
         920210 211850.51      787.       342.      642.     -17.     89298       221

6844     65.91     108.42   -.0033  71 015  CL   135.71    920211
         920211 190627.82      866.      -272.     1563.     -13.     95219       393

6846     74.00     114.92   -.0000  73 069   3     9.26    920211
         920210 223052.30      782.       -19.     -315.      12.     89405       242

6938     96.93     114.58   -.0000  73 088   0    24.60    920211
         920211 131840.00      791.         9.     -123.     -12.     90233       383

6976     13.18    1514.99   0.0060  73 100   0    46.12    920211
         920211 094223.80    19957.      -729.    -4069.      14.     89832       233
         920211 094258.77    19956.      -726.    -4057.      -7.     89832       233
         920211 094331.28    19955.      -723.    -4045.     -25.     89832       233
         920211 094402.72    19955.      -720.    -4034.     -45.     89832       233

6985     74.03     113.99   -.0000  73 104   A   212.68    920211
         920211 191448.82      775.         7.      161.      -1.     95222       393

7004     73.98     103.21   -.0029  73 107   B    46.00    920231
         920113 055312.35      705.        52.    -1396.     -18.     12102       399
         920113 055336.03      705.        40.    -1411.      10.     12102       399

7015    101.75     123.50   -.0000  73 086   F   208.21    920211
         920231 203800.34     1154.        -9.       -7.      14.      7015       399
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  SAT       INC    PERIOD      DRAG  INTL DESIG     R.A.     EPOCH
           DATE      TIME       ALT         ΔU       ΔV        ΔW        TAG    SENSOR


 7017    102.38    116.43   -.0000  73 086   H     34.81    920211
          920202 213449.99     832.      -295.     1597.       -0.     88968       398

 7035    101.79    121.88    .0000  73 066  AB      4.74    920211
          920210 200639.51     791.      -382.     1095.       -8.     82080       222
          920210 200720.38     785.      -356.      948.        8.     82080       222

 7074    101.94    113.23   -.0000  73 086  BS    122.38    920211
          920211 141832.10     779.        99.      223.       -6.     89505       221

 7076    102.12    116.19   -.0000  73 086  BU     14.37    920211
          920211 191017.87     788.      -371.    -1665.        9.     95222       393

 7079    101.94    116.73   -.0000  73 086  BX      9.78    920211
          920117 033604.77     856.      -227.     1457.        4.     21538       329

 7088    102.38    112.90   -.0008  73 086  CG    354.11    920210
          920211 193756.79     638.      -228.      636.       -1.     90000       329

 7126    102.09    116.55   -.0003  73 086  CQ     21.12    920211
          920210 230431.24     769.        17.       71.      -20.     89413       242
          920210 230559.01     744.       -26.     -270.        7.     89413       242
          920210 230640.35     775.       -13.     -441.       19.     89413       242

 7137    101.91    115.01   -.0002  73 086  OB     33.42    920211
          920211 191315.07     780.       -66.     -664.      -19.     95222       393

 7162    101.51    114.46   -.0007  73 086  EA    302.61    920211
          920211 175401.07     796.        20.       77.       -4.     89416       242

 7182    102.45    113.56    .0000  73 086  ET    315.24    920211
          920211 051543.14     776.       -98.      960.       14.     94699       399

 7210     81.24    102.03   -.0001  74 011   B     98.89    920211
          920211 073938.33     472.      -136.     1162.       -3.     89324       232
          920211 074001.84     426.      -141.     1014.        7.     89324       232

 7213     97.81    100.41   -.0004  74 013   A     29.55    920211
          920211 191058.55     482.        93.     -260.       -5.     95223       393

 7218     99.10    101.00   -.0002  74 015   A    201.54    920211
          920211 080948.96     428.      -202.     1154.       11.     90000       329

 7273     74.02    117.04    .0000  74 024   J     16.00    920211
          920211 074226.79     887.      -165.     1401.       13.     93925       396
          920211 074236.71     884.      -168.     1399.        4.     93925       396
          920211 074246.53     881.      -171.     1398.      -11.     93925       396

 7324     32.14   1430.39   0.0000  74 039   C     41.95    920211
          920210 223733.02   19316.         0.        1.       -2.     89409       242
          920210 223804.25   19316.         0.        1.       -2.     89409       242
          920210 223832.15   19316.         0.        1.       -2.     89409       242
          920210 223900.67   19316.         0.        1.       -2.     89409       242
          920210 224923.21   19305.       -71.    -1622.      -37.     89416       242
          920210 224954.97   19305.       -71.    -1622.      -32.     89416       242
          920210 225040.46   19305.       -71.    -1622.      -26.     89416       242
          920210 225117.77   19305.       -71.    -1622.      -20.     89416       242
          920210 225302.73   19304.       -72.    -1621.       -5.     89417       242
          920210 225336.57   19304.       -72.    -1620.        0.     89417       242
          920210 225410.08   19304.       -72.    -1621.        5.     89417       242
          920210 225448.37   19304.       -72.    -1621.       11.     89417       242

 7337     82.96    104.71   -.0018  74 044   A    225.26    920211
 SAT        INC    PERIOD     DRAG  INTL DESIG     R.A.     EPOCH
            DATE      TIME     ALT         ΔU        ΔV        ΔW       TAG   SENSOR


         920208 120845.65     295.      -379.     1375.       10.     21538      398

7376     61.76    717.60    .0156  74 056   A    123.94    920211
         920211 034516.97   15154.       357.    13736.      -26.     83410      334
         920211 034526.89   15158.       405.    13714.      -40.     83410      334
         920211 034536.82   15170.       431.    13722.      -16.     83410      334
         920211 034546.75   15178.       477.    13706.      -12.     83410      334
         920211 034617.26   15205.       626.    13654.       21.     83410      334
         920211 034636.01   15223.       698.    13643.       45.     83410      334

7443     74.03    117.75   -.0000  74 072   J    127.88    920211
         920210 223448.82     910.       -45.      768.      -11.     90220      395
         920210 223458.82     908.       -40.      768.      -12.     90220      395
         920210 223508.82     908.       -43.      768.      -12.     90220      395
         920210 223516.82     909.       -45.      767.      -12.     90220      395
         920210 223528.82     910.       -43.      767.      -11.     90220      395
         920210 223538.82     910.       -43.      766.      -10.     90220      395
         920210 223548.82     910.       -42.      765.      -10.     90220      395
         920210 223558.82     910.       -41.      764.      -10.     90220      395
         920210 223608.82     910.       -41.      763.       -9.     90220      395
         920210 223618.82     910.       -40.      742.       -9.     90220      395

7487    103.18    102.58   -.0018  73 086  FT    150.26    920211
         920211 195321.20     380.       -12.       63.        9.     82082      243
         920211 195345.85     400.        10.      -34.       -0.     82082      243
         920211 195409.30     438.        47.     -123.      -11.     82082      243

7488    102.61    120.77   -.0022  73 086  FU    236.68    920211
         920129 235511.74     970.       -85.    -1603.      -11.     88788      398

7648     10.71   1447.07   0.0000  75 011   A     51.64    920208
         920210 225629.64   19526.      -634.    -5666.       -6.     89415      242
         920210 225706.13   19526.      -634.    -5665.       -5.     89415      242
         920210 225738.49   19526.      -834.    -5665.       -5.     89415      242
         920210 225805.88   19526.      -634.    -5664.       -5.     89415      242

7714     81.21    102.38   -.0001  75 023   A    193.03    920211
         920210 224108.97     460.        -9.       44.       -2.     89412      242

7780     62.05    717.55    .0015  75 036   A    269.04    920211
         920119 171712.01    1538.     -1273.     3518.      -41.     11718      398

7794     24.43    395.13   -.0454  75 038   O    242.38    920211
         920211 135603.88    1067.      -479.     3069.      -48.     94637      399

7831     73.99    117.99   -.0000  75 045   J    128.02    920211
         920210 223448.82     910.         0.        8.       -4.     90220      395
         920210 223458.82     908.        -2.        8.       -6.     90220      395
         920210 223508.82     908.        -2.        8.       -6.     90220      395
         920210 223518.82     909.        -2.        8.       -5.     90220      395
         920210 223528.82     910.        -1.        8.       -4.     90220      395
         920210 223538.82     910.        -1.        8.       -4.     90220      395
         920210 223548.82     910.        -1.        7.       -4.     90220      395
         920210 223558.82     910.        -1.        7.       -3.     90220      395
         920210 223608.82     910.        -1.        6.       -3.     90220      395
         920210 223618.82     910.        -1.        6.       -3.     90220      395

7842     98.00     96.98   -.0059  72 058   N    200.11    920211
         920205 214705.85     304.      -127.      740.       -4.     19994      399
         920210 093716.01     316.         3.      362.      -11.     15390      398

7850     98.16    102.40   -.0014  72 058   W    217.29    920211
         920211 182446.10     406.      -222.      585.      -20.     95201      393
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SAT        INC    PERIOD      DRAG  INTL DESIG     R.A.     EPOCH
           DATE       TIME     ALT        ΔU        ΔV        ΔW        TAG    SENSOR


7851      98.29    101.23   -.0022  72 058   X     55.22    920211
          920211 215900.43    514.     -379.     1968.      -12.     95283      393

7855      98.03     99.43   -.0040  72 058  A8     40.61    920211
          920119 123502.89    343.      -72.     -788.       1.     87302      396
          920119 123512.76    343.      -88.     -862.      -18.     87302      396

7943      98.39     98.11   -.0026  72 058  AB     83.93    920211
          920211 011211.40    358.     -323.     1552.       13.     94679      399

7959      97.98    102.64   -.0003  72 058  CP     92.30    920211
          920211 011415.85    464.       47.     -632.        5.     94679      399

8015      62.06    718.99   0.0000  75 063   A    270.73    920211
          920211 015706.30    705.    -1166.    -2172.       -1.     94682      399

8084      98.58    107.88   -.0007  72 058  DK    240.19    920211
          920122 120013.03    343.     -198.      945.       -5.     87302      396
          920122 120022.94    343.     -196.      946.       -4.     87302      396
          920122 120032.77    343.     -195.      946.       -3.     87302      396
          920211 193756.79    638.      205.      604.       -4.     90000      329

8127      81.22     92.84   -.0100  75 076   A    117.01    920211
          920211 125447.90    237.      -41.     -650.       14.     94139      393
          920211 125625.30    238.     -268.    -1422.       18.     94139      393

8133      25.33    103.04   -.0030  75 077   B    330.81    920211
          920129 235803.60    683.      -28.    -1733.      -15.     88788      398

8145     101.10    114.39   -.0001  74 089   P    251.94    920211
          920211 191146.42    784.       -6.     -340.      -15.     95222      393

8159     101.78    115.31   -.0003  74 089   7     57.88    920211
          920211 122444.75    600.     -312.    -1450.      -19.     93957      396

8178     101.98    117.15   -.0006  74 089  AO    225.34    920211
          920230 210033.55    935.       -1.      -41.        2.     89207      221

8181     101.46    116.21   -.0000  74 089  Ax    219.85    920211
          920211 102122.78    777.      -14.     -152.       13.     94491      399

8302     101.19    105.93   -.0029  74 089  BK    287.07    920211
          920211 031835.67    493.     -152.    -1105.      -16.     94687      399

8314      98.60     99.15   -.0012  72 058  EG     72.46    920211
          920211 001602.91    346.      -79.      822.       -1.     86631      329

8402     101.44    113.09   -.0042  74 089  CE     24.28    920211
          920211 131900.09    827.      -31.     1032.       -6.     96233      383

8405     102.67    127.77   -.0002  74 089  CH    278.90    920211
          920206 145927.72    876.     -236.     -683.      -14.     88079      398

8462      62.72    733.49    .0091  75 105   D    310.14    920211
          920211 053816.92  10071.      -18.     -562.      -44.     89812      232
          920211 053905.00   9988.      -24.     -618.      -33.     89812      232
          920211 053934.41   9936.      -28.     -653.      -27.     89812      232
          920211 054001.99   9888.      -32.     -685.      -21.     89812      232
          920211 054029.14   9840.      -36.     -716.      -15.     89812      232

8513      12.11   1435.77   0.0000  75 123   A     40.88    920211
          920210 224108.97  19325.       -0.        1.        4.     89412      242
          920210 224146.21  19325.       -0.        1.        4.     89412      242
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SAT       INC   PERIOD      DRAG  INTL DESIG    R.A.     EPOCH
         DATE       TIME      ALT         ΔU         ΔV        ΔW       TAG    SENSOR


         920210 224225.01   19324.        -0.         1.        4.     89412       242
         920210 224301.39   19324.        -0.         1.        4.     89412       242
         920210 224923.21   19308.       -69.     -1547.       47.     89416       242

8542     97.92     104.60   -.0004  72 058   GR   236.69    920211
         920117 115443.05     343.      -232.      -954.      -10.     87302       396
         920117 115452.92     343.      -233.      -953.       -8.     87302       396
         920117 115502.79     342.      -234.      -952.       -6.     87302       396

8547     46.57     328.28   -.2400  75 123    E   160.23    920209
         920211 165652.54    2785.       -94.       153.        0.      8547       334
         920211 165709.41    2753.       -94.       155.       -1.      8547       334
         920211 165753.26    2668.       -95.       156.        1.      8547       334
         920211 165814.93    2625.       -95.       155.       -2.      8547       334
         920211 165853.48    2550.       -96.       157.       -0.      8547       334
         920211 165915.29    2507.       -93.       1561       -3.      8547       334

8593    102.02     113.32   -.0000  74 089   DG    45.92    920211
         920211 201916.29     644.      -190.      1216.        9.     86628       329

8745     82.94     101.83   -.0034  76 022    B   103.90    920211
         920211 085601.02     688.       114.      -339.       -7.     89336       232

8789    102.24     116.25   -.0000  74 089   OR     2.21    920211
         920211 190627.82     866.        43.      -678.       -3.     95219       393

8968     97.64     101.64   -.0006  75 004   BA    17.56    920211
         920210 201902.81     376.      -127.       381.        2.     82080       222

8980     97.83      99.51   -.0009  75 004   BN    22.23    920211
         920210 200204.24     430.        -3.         8.       -4.     89207       221

9416     11.83    1436.19   0.0000  76 092    A    43.90    920209
         920210 224446.40   39426.      -607.     -5586.      -13.     89413       242
         920210 224519.31   19425.      -608.     -5587.       -9.     89413       242
         920210 224554.37   19425.      -608.     -5587.       -5.     89413       242
         920210 224624.95   19425.      -608.     -5588.       -1.     89413       242

9503     11.77    1436.85   0.0000  76 107    A    44.41    920211
         920210 224446.40   19227.       -19.      1237.      -45.     89413       242
         920210 224519.31   19227.       -19.      1236.      -41.     89413       242

9506     64.62     711.78   -.0105  76 105    O   299.24    920210
         920211 073057.02    1181.        78.      -732.        9.     89810       232
         920211 073121.06    1193.       103.      -847.       20.     89810       232
         920211 073142.81    1210.       329.      -954.       33.     89810       232

9666     99.28     107.69   -.0008  70 025   HK   299.66    920211
         920211 174235.53     671.        27.        92.       -6.     89415       241
         920211 174250.79     652.         9.        37.      -10.     89417       242
         920211 174354.95     619.       -26.      -209.       20.     89415       241
         920211 174407.61     622.       -26.      -258.       14.     89417       242

9681     97.91     100.22   -.0003  75 004   OC    48.91    920211
         920211 064713.93     436.      -377.      1669.        8.     93035       393

9723     65.78     113.92   -.0016  76 126    U    70.59    920211
         920211 015451.93     548.        17.      -822.        2.     94682       399

9795    102.02     114.45   -.0000  74 089   EA   264.41    920211
         920211 033904.59     711.      -1281      1240.       10.     93901       396
         920211 015700.30     705.      -389.      1742.      -13.     94682       399
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  SAT        INC   PERIOD     DRAG  INTL DESIG    R.A.     EPOCH
             DATE      TIME    ALT         ΔU      ΔV        ΔW       TAG    SENSOR


 9799      65.61   313.29   -.0003  76 126   Z   125.99    920211
           920119 123453.02    343.     -305.    1506.       -6.     87302       396

 9819      65.93   108.63   -.0051  76 126  AF   190.24    920211
           920211 225736.68    637.      -44.    1569.        4.     90000       329

 9826      65.82   110.99   -.0034  76 126  AN   141.21    920211
           920211 063818.29   1011.      140.    -586.        5.     94702       399

 9827      65.83   108.19   -.0047  76 126  AP   220.81    920211
           920211 035432.62    522.     -311.    1269.       14.     86607       329

 9829      63.03   717.56    .0001  77 010   A   355.05    920211
           920211 073938.33   8573.      -69.   -2132.       45.     89324       232
           920211 074001.84   6534.      -69.   -2150.       36.     89324       232

 9852      10.47  1440.05   0.0000  77 014   A    52.02    920211
           920210 225629.64  19437.     -577.   -5391.       23.     89415       242
           920210 225706.13  19437.     -577.   -5391.       23.     89415       242
           920210 225738.49  19437.     -577.   -5391.       23.     89415       242
           920210 225805.88  19437.     -577.   -5390.       23.     89415       242

 9921      67.70   724.08    .0115  77 027   D    85.92    920211
           920211 064649.66  19631.        2.     715.       40.     89871       231

 9951      65.81   111.56   -.0013  76 326  AR   207.72    920210
           920211 182447.91    986.     -306.   -1439.        2.     10617       396
           920129 235638.11    822.       43.    -766.       12.     88788       398
           920211 102022.85    695.      -30.     348.      -17.     94491       399

 9962      65.81   109.80   -.0031  76 126  BC    34.04    920212
           920211 101933.53    631.      119.    -668.       17.     94491       399

 9973      62.42   109.09   -.0030  6806.7  DV   197.20    920209
           920211 003102.63    453.     -350.    1105.       15.     90000       329

 9982      65.90   133.55   -.0002  77 012   F    16.78    920211
           920210 230431.24   1709.      172.   -2144.      -21.     89413       242

10010      65.86   117.05    .0000  77 036   A   199.64    920211
           920129 235410.28   1081.     -389.    2237.       16.     88788       398

10013      65.87   117.03   -.0000  77 036   C   200.91    920231
           920211 090755.60   1160.      201.     690.       -5.     90437       385
           920211 131940.26    904.     -317.    -974.       14.     90233       363

10092      62.70   708.87   -.1774  77 054   A    32.65    920211
           920211 073534.40  21271.      -58.     814.        4.     89812       232
           920211 073559.85  21267.      -59.     815.        7.     89812       232
           920211 073620.29  21264.      -59.     816.       10.     89812       232
           920211 073641.53  21251.      -59.     816.       12.     89812       232

10144      29.08   108.77   -.0005  77 065   B   174.25    920211
           920211 152506.47    699.      -81.    1342.      -16.     81580       399
           920129 235511.74    970.      276.   -1079.        1.     88788       398

10178      28.74   120.83   -.0011  77 065   G    24.39    920212
           920211 025141.64    465.      -46.     230.       -1.     93690       399

10183      29.21   108.09   -.0008  77 065   M   165.63    920213
           920126 232902.17    604.     -129.   -1010.        7.     88892       398

10184      29.05   109.91   -.0006  77 065   N   211.59    920211
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  SAT        INC    PERIOD      DRAG  INTL DESIG     R.A.     EPOCH
            DATE      TIME       ALT         ΔU        ΔV        ΔW       TAG   SENSOR


           920211 154334.42      418.      -159.    -1469.        3.     19261      399
           920210 234322.80     1029.      -360.    -2401.      -20.     90406      385

 10198     29.56    111.33     .0000  77 065  AB    129.13    920211
           920211 175828.40     1043.        56.      684.       -2.     90004      241
           920211 175847.64     1016.        43.      613.      -10.     89416      242
           920211 175859.75     1002.        36.      566.       16.     90004      241

 10202     29.17     99.06    -.0144  77 065  AF    326.94    920211
           920211 021535.47      336.      -274.    -1011.       11.     94560      399

 10211     29.43    114.97    -.0001  77 065  AQ    161.40    920211
           920200 095345.03      700.       -75.     1516.      -14.     15390      398
           920205 130558.03      515.      -213.     -108.       19.     88079      398

 10212     28.93    103.96    -.0079  77 065   H    211.40    920211
           920211 135429.55      448.       100.      333.       10.     80069      399
           920211 154334.42      418.       -69.     1169.       10.     19261      399

 10226     29.15    101.95    -.0079  77 065  BD    202.75    920211
           920124 052920.50      515.         5.     -214.       -1.     12102      385

 10246     29.04    104.65    -.0065  77 065  BX     47.16    920212
           920211 073057.02      497.       -53.      111.       15.     89810      232
           920211 073121.06      530.       -24.       42.       20.     89810      232

 10252     28.65    110.52    -.0007  77 065  CD     27.25    920211
           920211 091049.88      351.        29.      -96.       15.     89376      232

 10262     29.08    107.84    -.0025  77 065  CP    341.02    920212
           920211 220531.05      268.      -354.      950.       14.     94745      399

 10269     29.09    101.03    -.0053  77 065  CW     77.76    920211
           920211 091904.06      497.      -179.     -363.       16.     89832      232

 10286     74.03    114.40    -.0000  77 079   B    318.66    920211
           920211 103614.94      801.        10.      230.       -5.     89832      231
           920211 103641.84      795.         8.      128.        8.     89832      231
           920211 103708.06      795.        10.       30.       15.     89832      231
           920211 103754.13      810.        23.     -143.       18.     89832      231

 10338     29.07    107.57    -.0027  77 065  DM    211.89    920211
           920211 104927.81      883.       -66.     -876.       -3.     94257      399

 10346     29.23    109.90    -.0024  77 065  0v    191.84    920211
           920211 124642.45      291.      -386.     -775.      -10.     14362      399

 10365     11.34   1436.88    0.0000  77 092   A     47.46    920211
           920210 223052.30    19411.      -550.     5080.      -13.     89405      242
           920210 223123.74    19411.      -551.     5080.       -7.     89405      242
           920210 223157.03    19411.      -551.     5080.       -2.     89405      242
           920210 223225.69    19411.      -551.     5080.        4.     89405      242
           920210 223358.66    19410.      -552.     5080.       20.     89407      242
           920210 223430.21    19410.      -552.     5080.       25.     89407      242
           920210 223458.74    19410.      -552.     5080.       30.     89407      242
           920210 223607.20    19410.      -552.     5080.       42.     89407      242
           920210 230244.97    19434.       -88.     2382.      -47.     89413      242
           920210 230314.40    19434.       -88.     2382.      -44.     89413      242
           920210 230347.57    19434.       -88.     2382.      -41.     89413      242
           920210 230431.24    19434.       -88.     2382.      -36.     89413      242
           920230 230559.01    19434.       -88.     2381.      -27.     89413      242
           920210 230640.35    19434.       -88.     2381.      -24.     89413      242
           920210 230710.23    19434.       -88.     2381.      -21.     89413      242
 SAT        INC   PERIOD      DRAG  INTL DESIG     R.A.     EPOCH
           DATE       TIME     ALT         ΔU        ΔV       ΔW        TAG    SENSOR


         920210 230740.94   19434.       -88.     2381.      -18.    89413       242
         920210 230912.44   19434.       -89.     2380.       -9.    89413       242
         920210 230946.67   19434.       -89.     2380.       -5.    89413       242

10417    65.58    115.63   -.0001  76 067   L    37.77    920208
         920113 055509.32     706.       -81.     -416.       -1.    12102       399

10436    66.02    116.51   -.0001  76 067   M    54.75    920211
         920210 223448.82     910.      -284.     1513.       17.    90220       395

10444    05.80    115.22   -.0001  75 067   V    28.97    920212
         920211 074246.53     681.      -400.     2500.       -0.    93925       396

10445    65.96    119.23   -.0002  75 067   W   197.99    920211
         920210 230020.69    1207.        13.      961.       20.    89413       242
         920210 230113.87    1135.       -13.      748.       -2.    89413       242
         920210 230142.26    1104.       -23.      639.      -13.    89413       242
         920211 090645.29    1124.       -97.    -1498.       19.    90437       385
         920211 090655.34    1131.       -96.    -1524.      -15.    90437       385

10447    65.87    116.50   -.0001  76 067   Y   326.72    920212
         920211 092134.88     610.        15.       34.       10.    89376       232
         920211 092159.30     581.       -18.      -41.      -13.    89376       232

10449    66.02    115.64    .0000  76 067  AA   194.71    920211
         920210 224554.37     624.       -20.      248.       14.    89413       242
         920210 224624.95     628.       -19.      132.        6.    89413       242

10453    65.80    116.02   -.0000  76 007  AE   201.63    920211
         920211 182408.83     993.       347.    -1080.       -7.    93979       396
         920211 182418.32     991.       345.    -1080.       11.    93979       396

10454    65.67    115.12   -.0001  76 067  AF   335.24    920211
         920211 100816.72     670.         9.      483.        8.    89813       232
         920211 100844.12     641.        -1.      368.       -6.    89813       232
         920211 100911.49     620.        -6.      256.      -14.    89813       232
         920211 100943.36     607.        -5.      128.      -16.    89813       232
         920211 075245.98     595.      -393.     -436.        2.    86768       329

10463    65.82    116.92    .0000  76 067  AG    36.91    920212
         920211 131950.30     924.       360.      479.       -2.    90233       383

10470    29.08    107.40   -.0031  77 065  EC   304.10    920212
         920211 204343.29     697.      -255.    -1975.      -12.    93455       399

10476    28.98    103.54   -.0031  77 065  EJ   107.75    920211
         920211 143905.62     338.      -393.     -106.       14.    94733       399

10519    29.06    109.68   -.0013  7711-8    C   158.33    920211
         920126 220347.36     869.       242.     1097.       11.    88892       398

10541    75.84    103.75   -.0000  77 123   B   356.62    920211
         920211 061207.43     489.         4.      561.       -5.    93915       396
         920211 061511.19     566.        83.      371.       -4.    93915       396

10569    65.40    105.08   -.0004  77 121   L    85.01    920211
         920211 073534.40     576.      -198.     1209.       -4.    89812       232
         920211 073559.85     534.      -201.     1070.      -19.    89812       232

10579    65.65    108.27   -.0001  77 121   W   294.86    920212
         920211 084751.73     615.       -29.     -172.       -7.    89832       232
         920211 084813.75     620.       -28.     -256.       -5.    89832       232
         920211 084836.37     631.       -24.     -344.       -7.    89832       232
 SAT        INC    PERIOD      DRAG  INTL DESIG     R.A.     EPOCH
           DATE       TIME      ALT          ΔU       ΔV        ΔW        TAG    SENSOR


          920211 084857.67      646.        -17.     -429.      -13.     89832       232

10599     82.94    104.66    -.0001  78 007   A    345.83    920211
          920211 061511.19      566.        -10.     -539.      -20.     93915       396

10614     65.73    116.25    -.0001  76 067  AN    224.47    920211
          920211 000514.37      624.       -330.     -180.        9.     86734       329

10617     65.63    116.50    -.0000  76 067  AK    219.73    920212
          920211 182910.50     1136.         -1.        0.        2.     10617       396
          920211 182930.24     3136.         -1.        0.        2.     10617       396
          920211 101030.77      745.        -32.      454.       -5.     94714       399

10626     29.18    108.99    -.0010  77 065  EV    305.80    920211
          920128 233141.60      664.       -304.    -3940.       12.     88892       398

10629     29.83    113.32    -.0003  77 065  EY    291.55    920211
          920209 024650.96     1012.       -205.     2345.      -20.     15390       398
          920210 235556.63      842.       -117.     1319.       16.     88075       399

10659    102.09    119.17    -.0001  76 077   V    198.34    920212
          920210 201619.90      974.        122.      448.       15.     82080       222
          920210 223518.82      909.       -137.    -1131.      -12.     90220       395

10718    101.62    116.02    -.0001  76 077  AP     57.54    920211
          920211 223435.15      708.       -117.     -861.        6.     94750       399

10723     29.66    556.01    -.0595  78 012   C    343.70    920211
          920211 144012.71    14566.         -4.    -5100.        4.     83999       221
          920211 144034.02    14586.         -3.    -5104.       16.     83999       221
          920211 144053.94    14604.         -3.    -5308.       28.     83999       221
          920211 144114.03    14622.         -3.    -5112.       40.     83999       221

10755    102.42    117.49    -.0000  76 077  3C      7.04    920211
          920114 202056.60      875.       -270.    -1595.        2.     21692       398

10760    101.40    118.16     .0001  76 077  BH    310.82    920211
          920211 171158.80      726.       -237.     1447.       -9.     94742       399

10826    102.32    117.32     .0004  76 077  BW    297.55    920211
          920211 173319.96      958.         82.      269.      -15.     90001       241
          920211 173345.84      918.         49.      174.       -4.     90001       241
          920211 173350.45      912.         44.      159.       -8.     90002       242
          920211 173433.40      863.          1.        2.        8.     90002       242
          920211 173502.61      842.        -19.     -107.       19.     90002       242

10829    101.92    116.60    -.0000  76 077  BZ    310.32    920211
          920211 103708.06      823.        -69.      770.        0.     89832       231

10837    102.22    119.70     .0000  70 077  CH    193.12    920211
          920210 223225.69     1010.         65.     -249.       13.     89405       242

10882     65.83    105.23    -.0003  77 121  AD    336.35    920211
          920211 075245.98      595.        -47.    -1057.        9.     86768       329

10894     64.35    286.65     .0014  78 047   B    257.39    920211
          920209 023857.23     1795.        594.     -320.      -22.     15390       398

10933     74.03    115.65    -.0000  78 056   0    133.79    920211
          920211 051730.95      821.        -94.      990.        2.     94699       399

10960     64.35    314.40     .0001  77 053   8    131.71    920231
          920211 191146.42      784.         47.     1250.      -10.     95222       393
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  SAT        INC    PERIOD     DRAG  INTL DESIG     R.A.     EPOCH
            DATE        TIME    ALT          ΔU       ΔV        ΔW       TAG    SENSOR


10992      82.94    104.59   -.0001  78 074   B   327.77    920211
          920211 194036.11     547.         26.      36.       -2.     87272       396

11028      31.20    336.39   -.0437  78 087   8    92.11    920116
          920211 075734.75    2219.        271.    2293.      -41.     89871       231

11080      99.15    104.07   -.0001  78 098   A   302.66    920211
          920211 095328.07     513.        -18.     360.        9.     89832       232

11145       8.26   1436.15   0.0000  78 113   B    61.32    920211
          920210 223052.30   19303.       -234.    3130.      -31.     89405       242
          920210 223123.74   19303.       -234.    3129.      -29.     89405       242
          920210 223157.03   19303.       -234.    3129.      -27.     89405       242
          920210 223225.69   19303.       -234.    3129.      -25.     89405       242
          920210 223358.66   19302.       -235.    3129.      -19.     89407       242
          920210 223430.21   19302.       -235.    3129.      -17.     89407       242
          920210 223458.74   19302.       -235.    3129.      -16.     89407       242
          920210 223607.20   19302.       -235.    3129.      -11.     89407       242
          920211 172857.63   19316.         -1.     281.      -12.     90000       241
          920211 172923.67   19316.         -1.     282.      -13.     90000       241
          920211 172952.42   19316.         -1.     282.      -13.     90000       241
          920211 173019.24   19316.         -1.     283.      -13.     90000       241
          920211 173159.75   19315.         -1.     144.       17.     90001       241
          920211 173236.93   19315.         -1.     141.       17.     90001       241
          920211 173319.96   19315.         -1.     138.       17.     90001       241
          920211 173345.84   19315.         -1.     135.       18.     90001       241
          920211 173350.45   19316.         -0.       7.        4.     90002       242
          920211 173433.40   19316.         -0.       7.        4.     90002       242
          920211 173502.61   19316.         -0.       7.        4.     90002       242
          920211 173530.30   19316.         -0.       7.        4.     90002       242
          920211 173616.76   19316.         -0.       6.        4.     90003       241
          920211 173652.59   19316.         -0.       7.        4.     90003       241
          920211 173725.84   19316.         -0.       7.        4.     90003       241
          920211 173743.47   19316.         -0.       7.        4.     89417       242
          920211 173801.52   19316.         -0.       7.        4.     90003       241
          920211 173812.63   19316.         -0.       7.        4.     89417       242
          920211 173841.65   19316.         -0.       7.        4.     89417       242
          920211 173911.53   19316.         -0.       7.        4.     89417       242
          920211 174036.02   19316.         -0.       7.        4.     89417       242
          920211 174100.85   19316.         -0.       7.        4.     89417       242
          920211 174117.68   19317.         -1.     296.      -19.     89415       241
          920211 174127.77   19316.         -0.       7.        4.     89417       242
          920211 174144.50   19317.         -1.     291.      -19.     89415       241
          920211 174154.62   19316.         -6.       7.        4.     89417       242
          920211 174209.95   19317.         -1.     291.      -20.     89415       241
          920211 174235.53   19317.         -1.     291.      -20.     89415       241
          920211 174250.79   19316.         -0.       7.        4.     89417       242
          920211 174354.95   19317.         -1.     262.      -21.     89415       241
          920211 174407.61   19316.         -0.       7.        4.     89417       242
          920211 174419.76   19317.         -1.     293.      -21.     89415       241
          920211 174433.94   19316.         -0.       7.        4.     89417       242
          920211 174443.66   19317.         -1.     293.      -21.     89415       241
          920211 174459.73   19316.         -0.       7.        4.     89417       242
          920211 174508.59   19317.         -1.     293.      -21.     89415       241
          920211 174525.20   19316.         -0.       7.        4.     89417       242
          920211 174633.88   19317.         -1.     294.      -22.     89415       241
          920211 174634.25   19316.         -0.       6.        4.     89417       242
          920211 174701.55   19317.         -1.     295.      -22.     89415       241
          920211 174711.38   19316.         -0.       7.        4.     89417       242
          920211 174726.68   19317.         -1.     295.      -22.     89415       241
          920211 174738.50   19316.         -0.       6.        4.     89417       242
          920211 174751.79   19317.         -1.     295.      -23.     89415       241
          920211 174808.02   19316.         -0.       6.        4.     89417       242
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 SAT        INC   PERIOD      DRAG  INTL DESIG    R.A.     EPOCH
            DATE       TIME    ALT         ΔU       ΔV        ΔW        TAG   SENSOR


          920211 174913.13   19317.        -1.      296.      -23.     89415     241
          920211 174940.71   19317.        -3.      296.      -24.     89415     241
          920211 175001.63   19335.        -1.       61.       25.     89416     242
          920211 175006.70   19317.        -1.      297.      -24.     89415     241
          920211 175039.33   19317.        -1.      297.      -24.     89415     241
          920211 175040.69   19315.        -1.       58.       25.     89416     242
          920211 175147.94   19315.        -1.       53.       25.     89416     242
          920211 175257.00   19315.        -1.       48.       26.     89416     242
          920211 175401.07   19315.        -3.       43.       26.     89416     242
          920211 175544.14   19315.        -1.       35.       27.     89416     242
          920211 175610.24   19315.        -1.       33.       27.     89416     242
          920211 175641.24   19315.        -1.       30.       27.     89416     242
          920211 175709.66   19315.        -3.       28.       28.     89416     242
          920211 175728.50   19316.        -0.        6.        5.     90004     241
          920211 175758.10   19336.        -0.        6.        4.     90004     241
          920211 175828.40   19336.        -0.        6.        4.     90004     241
          920211 175847.64   19315.        -1.       21.       28.     89416     242
          920211 175859.75   19316.        -0.        6.        4.     90004     241
          920211 175917.69   19315.        -1.       19.       29.     89416     242
          920211 175951.58   19315.        -1.       16.       29.     89416     242
          920211 180017.19   19315.        -1.       14.       29.     89416     242

11269     81.24     95.32   -.0020  79 012   B   252.73    920212
          920211 020456.34     282.      -257.    -1300.       17.     14362     396
          920211 020506.16     282.      -257.    -1300.       15.     14362     396
          920211 020516.03     282.      -257.    -1299.       13.     14362     396

11332     81.24     95.90   -.0016  79 032   B   181.37    920211
          920211 091102.01     320.        -0.       -0.       -0.     11332     396
          920211 091111.88     320.        -0.       -0.       -0.     11332     396

11343     10.50   1436.46   0.0000  79 035   A    52.23    920210
          920210 225629.64   19326.         0.        2.        0.     89415     242
          920210 225706.13   19326.         0.        2.        0.     89415     242
          920210 225738.49   19326.         0.        2.        0.     89415     242
          920210 225805.88   19326.         0.        2.        0.     89415     242

11353      8.20   1436.12   0.0000  79 038   A    57.20    920203
          920211 195321.20   19314.       -20.      906.      -21.     82082     243
          920211 195345.85   19314.       -20.      906.      -19.     82082     243
          920211 195409.30   19314.       720.      906.      -18.     82082     243
          920211 195434.07   19314.       -20.      906.      -17.     82082     243
          920210 223900.67   19316.        -6.      444.       49.     89409     242
          920210 224108.97   19320.        -1.      361.      -42.     89412     242
          920210 224146.21   19320.        -1.      360.      -47.     89412     242

11622      7.87   1436.16   0.0000  79 098   B    62.23    920210
          920210 223052.30   19357.      -746.     5868.       44.     89405     242
          920210 223123.74   19357.      -746.     5868.       47.     89405     242
          920210 223157.03   19357.      -746.     5869.       48.     89405     242
          920210 223225.69   19357.      -746.     5868.       50.     89405     242
          920210 223733.02   19383.      -252.     3687.      -36.     89409     242
          920210 223804.25   19383.      -251.     3687.      -43.     89409     242
          920210 223832.15   19383.      -251.     3687.      -47.     89409     242
          920210 224446.40   19382.      -177.     3190.        5.     89413     242
          920210 224519.31   19382.      -177.     3189.        4.     89413     242
          920210 224554.37   19382.      -177.     3189.        3.     89413     242
          920210 224624.95   19382.      -177.     3189.        2.     89413     242
          920210 224923.21   19376.       -54.     2068.      -30.     89416     242
          920210 224954.97   19176.       -54.     2069.      -31.     89416     242
          920210 225040.40   19376.       -54.     2069.      -31.     89416     242
          920210 225117.77   19376.       -54.     2069.      -32.     89416     242
          920210 225302.73   19376.       -54.     2070.      -33.     89417     242
 SAT       INC   PERIOD     DRAG  INTL DESIG     R.A.     EPOCH
           DATE     TIME     ALT        ΔU        ΔV        ΔW          TAG    SENSOR


          920210 225336.57  19376.      -54.     2072.      -33.     89417       242
          920210 225410.08  19376.      -54.     2071.      -33.     89417       242
          920210 225448.37  19376.      -54.     2072.      -34.     89417       242
          920210 225947.88  19384.     -175.     3180.      -16.     89413       242
          920210 230020.69  19384.     -175.     3180.      -17.     89413       242
          920210 230113.87  19384.     -174.     3179.      -18.     89413       242
          920210 230142.26  19384.     -174.     3179.      -19.     89413       242
          920210 230244.97  19384.     -174.     3178.      -20.     89413       242
          920210 230314.40  19384.     -174.     3178.      -21.     89413       242
          920210 230347.57  19384.     -174.     3177.      -22.     89413       242
          920210 230431.24  19384.     -174.     3177.      -23.     89413       242
          920210 230559.01  19384.     -174.     3176.      -25.     89413       242
          920210 230640.35  19384.     -173.     3176.      -26.     89413       242
          920210 230710.23  19384.     -173.     3175.      -27.     89413       242
          920210 230740.94  19384.     -173.     3175.      -27.     89413       242
          920210 230912.44  19385.     -173.     3174.      -33.     89413       242
          920210 230946.07  19385.     -173.     3173.      -30.     89413       242
          920210 231016.88  19385.     -173.     3173.      -31.     89413       242
          920210 231048.99  19385.     -173.     3173.      -32.     89413       242

11683     81.22     96.17  -.0015  80 008    B    182.37    920211
          920124 123835.16    344.     -191.     1235.      -14.     87302       396
          920124 123845.03    344.     -190.     1230.        6.     87302       396

11690     64.50    718.02  -.0001  80 011    A     73.23    920210
          920211 092047.21  10677.     -440.     1931.       13.     89376       232
          920211 092111.34  10679.     -434.     1908.       21.     89376       232
          920211 092134.88  10681.     -428.     1885.       29.     89376       232
          920211 092159.30  10683.     -423.     1861.       37.     89376       232

11708      9.81   1437.09  0.0000  80 016    A     53.25    920211
          920210 223052.30  19335.     -318.     3748.      -39.     89405       242
          920210 223123.74  19335.     -318.     3747.      -35.     89405       242
          920210 223157.03  19335.     -318.     3748.      -31.     89405       242
          920210 223225.69  19335.     -318.     3747.      -27.     89405       242
          920210 223356.66  19335.     -318.     3747.      -16.     89407       242
          920210 223430.21  19334.     -318.     3747.      -12.     89407       242
          920210 223458.74  19334.     -318.     3747.       -9.     89407       242
          920210 223607.20  19334.     -319.     3747.       -1.     89407       242
          920210 232056.94  19352.      -13.     1004.      -21.     89413       242
          920210 232721.32  19352.      -13.     1004.      -20.     89413       242
          920210 232742.25  19352.      -13.     1004.      -19.     89413       242
          920210 232803.48  19352.      -13.     1003.      -18.     89413       242

11718     24.45    324.18  -.0228  80 018    2    245.47    920211
          920119 171545.10   1378.     -177.     -340.       -1.     11718       398
          920119 171712.01   1538.     -179.     -3301       -1.     11718       398
          920119 171847.70   1717.     -180.     -319.       -1.     11718       398
          920119 172022.91   1897.     -179.     -308.       -0.     11718       398
          920119 172158.36   2079.     -179.     -297.       -1.     11718       398
          920119 172334.05   2262.     -179.     -291.       -0.     11718       398

11765     66.11    103.22  -.0020  80 030    A    305.32    920212
          920211 032423.85    205.     -254.     -473.        8.     86666       329

11791     63.20    217.37  -.0469  80 032    B     16.09    920211
          920210 201818.77   1731.      195.     2016.       -1.     82080       222

11848     97.69     90.60  -.0538  80 051    A    190.13    920211
          920211 032935.70    353.       -9.        2.       -9.     90008       329
          920211 032958.30    164.        2.        2.        2.     90000       329

12054     64.99     97.88  -.0027  80 089    A    146.24    920211
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  SAT        INC   PERIOD       DRAG  INTL DESIG      R.A.      EPOCH
            DATE       TIME      ALT          ΔU        ΔV         ΔW         TAG    SENSOR


          920115 235238.80       430.     -102.      1324.        11.      88904        398

12102     90.30    111.35    -.0000  65 027    G    104.24     920130
          920113 055312.35       705.     -337.     -1663.        16.      12102        399
          920113 055336.03       705.     -338.     -1664.        16.      12102        399
          920113 055423.11       706.     -338.     -1664.        15.      12102        399
          920113 055509.31       706.     -339.     -1665.        15.      12102        399
          920113 055555.20       706.     -339.     -1667.        15.      12102        399
          920211 075734.75       730.       20.       136.        -5.      89871        231

12120      9.41   1435.61    0.0000  80 104    A     56.46     920209
          920210 225629.64     19438.     -461.      5194.        49.      89415        242
          920210 225706.13     19438.     -461.      5194.        48.      89415        242
          920210 225738.49     19439.     -461.      5194.        46.      89415        242
          920210 225805.88     19439.     -461.      5194.        45.      89415        242

12139     82.96    105.22    -.0026  81 003    8    290.85     920211
          920211 175606.24       404.      129.       645.        -8.      93974        396
          920211 175616.11       404.      143.       563.        -6.      93974        396
          920211 175625.98       404.      155.       479.        -4.      93974        396
          920211 175635.85       404.      165.       395.        -1.      93974        396
          920211 175645.72       404.      174.       311.         1.      93974        396

12155     81.17     96.56    -.0005  81 008    B    253.71     920212
          920211 012736.11       276.     -152.       822.        -0.      93888        396

12165     98.91    102.25    -.0001  78 026    E     18.45     920211
          920210 195115.32       473.       -5.       237.         6.      89207        221
          920210 195202.62       467.       -3.        44.        17.      89207        221

12166     96.92    102.12    -.0003  78 026    F     22.03     920211
          920211 043719.26       444.      155.      -975.         6.      86777        329

12179     98.86    103.48    -.0003  78 026    U    288.80     920211
          920211 153334.38       506.      -98.      -534.         2.      94638        399

12201     98.97    103.87    -.0001  78 026   AS    301.44     920211
          920211 094615.92       469.      -24.       284.         2.      89832        233
          920211 094655.26       466.      -17.       125.        13.      89832        233

12212     99.11    103.27    -.0002  78 026   BD    343.09     920211
          920211 124108.50       482.      -19.       -24.         9.      80108        231

12232     98.92    102.18    -.0025  78 026   BZ    320.25     920211
          920211 003102.63       453.     -327.     -1666.        13.      90000        329

12257     99.07    103.14    -.0003  78 026   OA    337.59     920211
          920131 192428.77       553.       -3.      -673.         8.      19881        398

12283     98.58    103.30    -.0003  78 026   EC     29.49     920211
          920210 211850.51       399.     -153.       747.         4.      89298        221

12294     98.39    100.78    -.0001  78 026   EP     50.48     920211
          920211 064713.93       436.     -163.      1015.         9.      93035        393

12295     28.20    397.18    -.0476  81 012    A    213.39     920208
          920211 200107.59     11498.     -747.     -7412.       -16.      83421        369
          920211 200156.80     11431.     -861.     -7403.        31.      83421        369
          920211 112917.85       870.      534.     -1285.        47.      94718        399
          920211 112934.68       849.      477.     -1383.       -32.      94718        399
          920211 113622.28       986.     -800.     -3149.       -21.      93878        399

12321     74.03    114.62     .0000  81 022    B     14.75     920212
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 SAT        INC   PERIOD      DRAG  INTL DESIG     R.A.      EPOCH
            DATE      TIME     ALT        ΔU       ΔV         ΔW        TAG    SENSOR


          920211 131155.08     797.      -65.      936.       -2.     90062      395

12322     74.03   114.78    -.0000  81 022   C    31.55    920211
          920210 195115.32     766.       -0.       36.        3.     89207      221
          920210 195202.62     786.       18.     -144.        7.     89207      221

12330     65.37   133.99    -.0003  78 014   B   346.55    920211
          920211 125935.77     239.     -399.     -346.      -15.     94139      393

12333     65.86   116.82    -.0000  76 067  AZ    24.33    920212
          920210 200639.51     734.      145.      551.      -10.     82080      222

12347     66.05    97.43    -.0139  80 030   V   337.19    920211
          920211 205718.99     459.       98.     -415.       10.     94000      396

12388     82.97   106.30    -.0019  81 033   A   147.22    920211
          920211 145431.02     320.      -29.     1020.        6.     86799      329
          920211 131534.37     251.     -250.    -1324.       -1.     94145      393

12445     23.66   228.19    -.0059  60 098   B    10.44    920212
          920208 050819.64     380.      167.      245.       18.     15390      398

12497     23.96   221.00    -.0192  81 050   B   176.07    920211
          920206 150321.55    1264.      581.      -29.       14.     88079      398

12564      9.06  1436.70    0.0000  81 061   A    57.70    920211
          920210 192500.81   19330.    -1057.     6919.      -39.     11353      404
          920210 192718.05   19333.    -1052.     6913.      -14.     11353      404
          920210 192935.29   19337.    -1040.     6886.       -0.     11353      404
          920210 193152.53   19331.    -1065.     6950.       -9.     11353      404
          920210 193409.77   19330.    -1064.     6939.      -39.     11353      404
          920210 193627.01   19332.    -1060.     6936.      -21.     11353      404
          920210 194318.73   19333.    -1054.     6916.      -42.     11353      404

12644     74.04   117.49    -.0000  81 074   J   304.91    920211
          920122 075031.28     786.      -99.     -886.      -19.     88066      398

12677      7.52  1446.49    0.0000  81 076   A    62.16    920203
          920210 224108.97   19456.        1.       55.      -34.     89412      242
          920210 224146.21   19456.        1.       56.      -40.     89412      242
          920210 224225.01   19456.        2.       56.      -47.     89412      242
          920210 232656.94   19454.       -5.     -356.       40.     89413      242
          920210 232721.32   19454.       -5.     -356.       39.     89413      242
          920210 232742.25   19454.       -5.     -356.       38.     89413      242
          920210 232803.48   19454.       -5.     -356.       38.     89413      242

12694     83.09   106.35    -.0003  61 053  AN   312.98    920211
          920211 051519.34     516.     -195.    -1209.       17.     18601      399

12698     82.94   103.93    -.0018  81 053  AS   140.69    920211
          920211 101116.87     482.      -32.      192.      -15.     89813      232

12715     83.12   102.49    -.0010  81 053  BK   105.78    920211
          920211 224222.40     473.     -109.      980.       -8.     95291      393
          920211 224415.30     473.     -105.      978.       -4.     95291      393
          920211 224607.33     473.     -101.      974.       -0.     95291      393
          920211 224758.63     474.      -96.      971.        3.     95291      393
          920211 224950.13     474.      -92.      966.        6.     95291      393

12720     83.26   105.36    -.0003  81 053  BM   338.52    920211
          920211 061147.69     490.      -95.     -285.       10.     93915      396

12731     82.94   105.01    -.0006  81 053  BY   173.33    920211
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SAT     INC      PERIOD  DRAG    INTL DESIG   R.A.  EPOCH
        DATE       TIME    ALT       ΔU       ΔV      ΔW      TAG  SENSOR


        920211 194036.11    547.    -208.   -1207.    -11.   87272     396

12733   82.89    103.73  -.0012  81 053  CA 111.90  920211
        920208 050624.96    500.     -26.    -314.    -17.   15390     398

12736   83.04    106.70  -.0003  81 053  CO 312.10  920211
        920207 161931.34    586.     -41.    -108.      2.   21538     384

12770   82.86    100.63  -.0017  81 053  DP 273.29  920211
        920211 081032.68    400.    -302.   -1328.      4.   90000     329

12782   88.00    105.55  -.0002  81 053  OY 234.70  920212
        920211 075245.98    595.    -352.    1770.     11.   86768     329

12786   82.49     97.38  -.0003  81 062   B  14.26  920211
        920208 094258.60    326.     -14.     127.     16.   15390     398

12849   82.50    108.26  -.0005  81 094   B 322.99  920211
        920211 174723.14    494.       3.    -834.     19.   13464     399

12864   65.84    104.69  -.0005  77 121  AS 332.39  920212
        920211 064807.63    583.    -151.   -1367.     -2.   90000     329

12869   65.79    105.65  -.0005  77 121  AX 115.34  920211
        920211 051554.33    517.    -343.    1434.      1.   18601     399

12879   82.60    115.92  -.0000  81 098   A 355.63  920211
        920211 131155.08    797.      -5.      12.      8.   90062     395

12897    8.81   1436.37  0.0000  81 102   A  58.24  920211
        920210 192609.43  19328.    -277.   -3493.     47.   11353     404
        920210 192826.67  19331.    -281.   -3539.     46.   11353     404
        920210 193043.91  19330.    -279.   -3518.     46.   11353     404
        920210 193301.15  19324.    -281.   -3492.    -12.   11353     404
        920210 193518.39  19323.    -276.   -3457.      5.   11353     404
        920210 193735.63  19328.    -285.   -3545.    -14.   11353     404
        920210 193844.25  19330.    -278.   -3514.     31.   11353     404
        920210 193952.87  19326.    -277.   -3484.     11.   11353     404
        920210 194101.49  19332.    -266.   -3574.     -4.   11353     404
        920210 194210.11  19326.    -273.   -3456.     34.   11353     404
        920210 194427.35  19330.    -279.   -3520.     19.   11353     404
        920210 194535.97  19328.    -274.   -3478.     32.   11353     404
        920210 194644.59  19330.    -273.   -3478.     44.   11353     404
        920210 195657.38  39324.    -277.   -3469.    -32.   11353     404
        920210 195806.00  19328.    -280.   -3521.    -28.   11353     404
        920210 200023.24  19326.    -277.   -3484.    -30.   11353     404
        920210 200131.86  19331.    -276.   -3516.      4.   11353     404
        920210 200240.48  19328.    -279.   -3511.    -37.   11353     404
        920210 200349.10  19328.    -280.   -3515.    -38.   11353     404
        920210 200457.72  19327.    -278.   -3500.    -36.   11353     404
        920210 203832.62  19333.    -274.   -3516.    -46.   11353     404
        920210 223052.30  19347.       4.    -824.    -43.   89405     242
        920210 223123.74  19347.       4.    -824.    -40.   89405     242
        920210 223157.03  19347.       4.    -824.    -37.   89405     242
        920210 223225.69  19347.       3.    -824.    -35.   89405     242
        920210 223358.66  19346.       3.    -824.    -27.   89407     242
        920210 223430.21  19346.       3.    -824.    -24.   89407     242
        920210 223458.74  19346.       3.    -824.    -22.   89407     242
        920210 223607.20  19346.       3.    -824.    -16.   89407     242

12947   83.09    107.88  -.0000  81 053  EB  45.31  920212
        920201 114549.92    537.    -210.   -1316.      5.   20672     398
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  SAT        INC   PERIOD      DRAG  INTL DESIG     R.A.     EPOCH
             DATE       TIME    ALT        ΔU        ΔV       ΔW        TAG    SENSOR


12959      63.91   717.62    -.0001  81 113   A     78.27    920211
           920204 143907.98    2578.      544.    -3877.      -42.     15390       398
           920209 024051.34    1601.    -1414.     3583.       49.     15390       398

12979      73.98   117.11     .0000  81 116   E    247.02    920211
           920211 144346.45     889.     -205.    -1469.      -13.     90236       383

12987      82.52    97.03    -.0007  81 117   A     68.33    920212
           920211 051116.85     350.       24.      -32.       16.     89810       232

12993      67.89   727.74     .0017  81 071   E    279.58    920208
           920211 082926.77   18791.      175.     4065.        8.     89336       232
           920211 083016.70   18770.      173.     4080.        4.     89336       232
           920211 083054.25   18753.      372.     4090.        2.     89336       232
           920211 083121.75   18741.      171.     4096.       -2.     89336       232
           920211 083244.24   16705.      168.     4319.       -9.     89336       232
           920211 083306.92   18695.      167.     4125.      -11.     89336       232
           920211 083330.45   18684.      166.     4132.      -13.     89336       232
           920211 083352.26   18674.      165.      4138      -15.     89336       232

13016      64.09   695.28    -.0021  81 123   D    204.61    920208
           920210 232656.94    3772.     -139.     1219.      -37.     89413       242
           920210 232721.32    3816.     -132.     1163.      -47.     89413       242

13024      82.94   104.20    -.0010  81 053  EW    143.50    920211
           920207 161911.26     552.      -12.      685.       16.     21538       384

13073      82.94   105.15    -.0081  81 053  EZ    174.96    920211
           920211 100014.31     588.       34.      157.      -16.     93937       396
           920211 100024.22     588.       34.      151.        5.     93937       390

13080      67.46   718.90     .0057  82 016   A    222.38    920211
           920208 215817.34    3708.     -117.    -1171.      -26.     15390       398

13112      64.35   730.91    -.0219  82 023   D     36.69    920211
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           920210 201942.02    3410.     -178.    -5671.       31.     89207       221
           920210 202051.21    3609.     -480.    -6154.       11.     89207       221
           920210 202159.98    3818.     -870.    -6629.      -11.     89207       221
           920210 202258.95    4003.    -1282.    -7020.      -29.     89207       221

13177       8.05  1436.37    0.0000  82 044   A     67.79    920210
           920211 195321.20   19333.       -1.        4.       21.     82682       243
           920211 195345.85   19333.       -1.        5.       21.     82082       243
           920211 195409.30   19333.       -1.        4.       21.     82082       243
           920211 195434.07   19333.       -1.        5.       21.     82082       243
           920210 225629.64   19329.      -40.    -1370.      -41.     89415       242
           920210 225706.13   19329.      -40.    -1371.      -45.     89415       242
           920210 225738.49   19329.      -40.    -1371.      -48.     89415       242

13269        .01  1436.03    0.0000  82 058   A    336.39    920209
           920211 085933.98   19403.       65.    -1033.      -16.     90600       951
           920211 085949.03   19403.       65.    -1033.      -16.     90000       951
           920211 090003.68   19403.       65.    -1033.      -16.     90000       951
           920211 090018.48   19403.       65.    -1033.      -16.     90600       951

13390      64.07   697.87    -.0021  82 074   D     36.69    920211
           920211 083352.26   19814.     -459.     7105.       29.     89336       232

13458      83.10   103.91    -.0004  81 053  FE    182.17    920211
           920211 060733.76     523.      -32.      625.      -17.     94707       399

13459      83.14   102.49    -.0064  81 053  FF    202.35    920211
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 SAT        INC    PERIOD      DRAG  INTL DESIG     R.A.     EPOCH
            DATE       TIME     ALT          ΔU       ΔV        ΔW        TAG    SENSOR


          920211 100402.07     4963.        -11.     293.       13.     93938       396

 13464    82.95     104.03    -.1067  81 053  FL    151.58    920210
          920211 064413.52      535.         -7.    -301.       -0.     13464       399
          920211 064650.14      533.         -7.    -303.       -0.     13464       399
          920211 065548.75      524.         -7.    -305.       -0.     13464       396
          920211 065558.62      5231         -7.    -305.        0.     13464       396
          920211 065608.49      523.         -7.    -305.       -0.     13464       396
          920211 174723.14      494.        -35.    -561.       -1.     13464       399

 13503    66.04     116.95    -.0002  76 067  BB    204.29    920231
          920208 094840.97      710.         96.     432.      -20.     15390       398

 13515    65.90     116.48    -.0002  76 067  BC     20.77    920211
          920210 201818.77     1104.        193.   -1137.       -6.     82080       222

 13554     6.09    1435.20    0.0000  82 093   A     59.39    920211
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          920211 195345.85    19408.       -293.   -4190.       17.     82082       243
          920211 195409.30    19408.       -293.   -4191.       18.     82082       243
          920211 195434.07    19408.       -293.   -4190.       19.     82082       243
          920210 223733.02    19433.       -372.   -4535.        6.     89409       242
          920210 223804.25    19434.       -372.   -4535.        2.     89409       242
          920210 223832.15    19434.       -372.   -4535.       -2.     89409       242
          920210 223900.67    19434.       -371.   -4535.       -6.     89409       242
          920210 224923.21    19426.       -762.   -6122.       11.     89416       242
          920210 224954.97    19426.       -762.   -6121.       11.     89416       242
          620210 225040.46    19427.       -761.   -6120.       11.     89416       242
          920210 225117.77    19427.       -761.   -6120.       11.     89416       242
          920210 225302.73    19427.       -761.   -6110.       11.     89417       242
          920210 225336.57    19427.       -761.   -6117.       11.     89417       242
          920210 225410.06    19427.       -761.   -6118.       11.     89417       242
          920210 225448.37    19427.       -761.   -6117.       11.     89417       242
          920210 225947.88    19435.       -482.   -5034.       41.     89413       242
          920210 230020.69    19435.       -482.   -8034.       41.     89413       242
          920210 230113.87    19435.       -482.   -5035.       41.     89413       242
          920210 230142.26    19435.       -482.   -5035.       40.     89413       242
          920210 230244.97    19435.       -482.   -5036.       39.     89413       242
          920210 230314.40    19435.       -462.   -5036.       39.     89413       242
          920210 230347.57    19435.       -482.   -5036.       38.     89413       242
          920210 230433.24    19436.       -482.   -5037.       38.     89413       242
          920210 230559.01    19436.       -482.   -5037.       37.     89413       242
          920210 230640.35    19436.       -482.   -5038.       37.     89413       242
          920210 230710.23    19436.       -482.   -5038.       36.     89413       242
          920210 230740.94    19436.       -483.   -5038.       36.     89413       242
          920210 230912.44    19436.       -483.   -5039.       35.     89413       242
          920210 230946.67    19436.       -483.   -5039.       34.     89413       242
          920210 231016.88    19436.       -483.   -5039.       34.     89413       242
          920210 231048.99    19437.       -483.   -5040.       34.     89413       242
          920210 232656.94    19439.       -485.   -5048.       23.     89413       242
          920210 232721.32    19439.       -485.   -5048.       22.     89413       242
          920210 232742.25    19439.       -485.   -5049.       22.     89413       242
          920210 232803.48    19439.       -485.   -5049.       22.     89413       242
          920211 172857.63    19392.       -495.   -5235.      -14.     90000       241
          920211 172923.67    19392.       -495.   -5235.      -14.     90000       241
          920211 172952.42    19392.       -495.   -5234.      -14.     90000       241
          920211 173019.24    19392.       -494.   -5234.      -14.     90000       241
          920211 173159.75    19391.       -528.   -5371.       16.     90001       241
          920211 173236.93    19391.       -529.   -5373.       16.     90001       241
          920211 173319.95    19391.       -530.   -5377.       17.     90001       241
          920211 173345.84    19391.       -531.   -5379.       18.     90001       241
          920211 173350.45    19392.       -561.   -5504.        4.     90002       242
          920211 173433.40    19392.       -561.   -5505.        4.     96002       242
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SAT        INC   PERIOD     DRAG  INTL DESIG     R.A.     EPOCH
           DATE       TIME     ALT        ΔU       ΔV        ΔW       TAG    SENSOR


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          920211 173530.30   19392.     -561.    -5505.        5.     90002       242
          920211 173616.76   19392.     -561.    -5508.        5.     90003       241
          920211 173652.59   19392.     -561.    -5506.        6.     90003       241
          920211 173725.84   19392.     -561.    -5506.        6.     90003       241
          920211 173743.47   19392.     -561.    -5506.        6.     89417       242
          920211 173801.52   19392.     -562.    -5506.        6.     90003       241
          920211 173812.63   19392.     -562.    -5506.        6.     89417       242
          920211 173841.65   19392.     -562.    -5506.        7.     89417       242
          920211 173911.53   19392.     -562.    -5506.        7.     89417       242
          920211 174036.02   19392.     -562.    -5507.        8.     89417       242
          920211 174100.85   19392.     -562.    -5507.        8.     89417       242
          920211 174117.68   19393.     -494.    -5230.      -14.     89415       241
          920211 174127.77   19393.     -562.    -5507.        3.     89417       242
          920211 174144.50   19393.     -494.    -5230.      -34.     89415       241
          920211 174154.62   19393.     -562.    -5507.        8.     89417       242
          920211 174209.95   19393.     -494.    -5230.      -34.     89415       241
          920211 174235.53   19393.     -494.    -5230.      -14.     89415       241
          920211 174250.79   19393.     -562.    -5507.        9.     89417       242
          920211 174354.95   19394.     -494.    -5229.      -14.     89415       241
          920211 174407.61   19393.     -563.    -5508.       10.     89417       242
          920211 174419.76   19394.     -494.    -5229.      -14.     89415       241
          920211 174433.94   19393.     -563.    -5508.       10.     89417       242
          920211 174443.66   19394.     -494.    -5229.      -14.     89415       241
          920211 174459.73   19393.     -563.    -5508.       10.     89417       242
          920211 174508.59   19394.     -494.    -5229.      -14.     89415       241
          920211 174525.20   19393.     -563.    -5508.       11.     89417       242
          920211 174633.88   19394.     -494.    -5228.      -13.     89415       241
          920211 174634.25   19393.     -563.    -5509.       11.     89417       242
          920211 174701.55   19394.     -494.    -5228.      -14.     89415       241
          920211 174711.38   19393.     -563.    -5509.       11.     89417       242
          920211 174726.68   19394.     -494.    -5228.      -13.     89415       241
          920211 174738.50   19393.     -563.    -5509.       12.     89417       242
          920211 174751.79   19394.     -494.    -5228.      -14.     89415       241
          920211 174808.02   19393.     -563.    -5509.       12.     89417       242
          920211 174913.11   19394.     -494.    -5227.      -13.     89415       241
          920211 174940.71   19394.     -494.    -5227.      -13.     89415       241
          920211 175001.63   19393.     -551.    -5456.       34.     89416       242
          920211 175006.70   19395.     -494.    -5227.      -13.     89415       241
          920211 175039.33   19395.     -494.    -5226.      -13.     89415       241
          920211 175040.69   19393.     -552.    -5460.       35.     89416       242
          920211 175147.94   19393.     -554.    -5465.       35.     89416       242
          920211 175257.00   19393.     -555.    -5470.       37.     89416       242
          920211 175401.07   19393.     -557.    -5476.       38.     89416       242
          920211 175544.14   19393.     -559.    -5484.       39.     89416       242
          920211 175610.24   19393.     -560.    -5486.       40.     89415       242
          920211 175641.24   19393.     -560.    -5488.       40.     89416       242
          920211 175709.66   19393.     -561.    -5490.       41.     89416       242
          920211 175728.50   19394.     -565.    -5513.       18.     90004       241
          920211 175758.10   19394.     -565.    -5513.       18.     90004       241
          920211 175828.40   19394.     -565.    -5513.       18.     90004       241
          920211 175847.64   19393.     -563.    -5498.       42.     89416       242
          920211 175859.75   19394.     -565.    -5513.       18.     90004       241
          920211 175917.69   19393.     -564.    -5500.       43.     89416       242
          920211 175951.58   19393.     -564.    -5503.       43.     89416       242
          920211 180017.19   19393.     -5651    -5505.       44.     89416       242

13562     98.87    101.73   -.0009  78 026  EZ    27.93     920211
          920211 205738.71     453.      -50.     4582.        5.     94000       396
          920211 205748.59     450.      -65.     -656.      -14.     94000       396

13574     99.03    102.46   -.0005  78 026  FM    10.34     920211
          920210 200221.59     474.      -15.       42.       12.     82080       222
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  SAT        INC   PERIOD      DRAG  INTL DESIG     R.A.     EPOCH
             DATE       TIME     ALT         ΔU       ΔV        ΔW       TAG   SENSOR


13609      52.06   309.11   -.0224  82 100   G    82.75    920210
           920124 052920.50    515.        47.     419.      -40.     12102      385

13648      74.00   100.62   -.0002  82 109   A   115.89    920211
           920211 091202.36    423.        -8.       6.      -18.     89376      232

13666      23.32   630.91   -.0120  82 110   E   274.94    920207
           920211 042832.11  17896.      1230.   13332.        7.      2865      369

13738      98.56    96.53   -.0074  82 138   C   267.48    920211
           920211 121911.27    357.       -31.     402.       -9.     86626      329

13757      82.91   104.65   -.0000  83 001   A    39.23    920212
           920208 120547.77    544.      -129.   -1019.       12.     21538      398

13780      28.49   157.61   -.0741  83 006   B    99.04    920211
           920211 131457.86   2877.       -33.   -2819.       20.     80108      334
           920211 035324.88   1892.      -361.    1717.       -1.     94652      399

13798      83.01   105.68   -.0002  81 053  GV   255.75    920231
           920211 054001.99    612.        59.      85.       11.     89812      232
           920211 054029.14    562.         8.      11.       -1.     89812      232

13814      82.95   103.67   -.0017  81 053  HM   135.67    920211
           920211 103954.72    475.       -31.    -101.        9.     89632      231
           920211 104037.63    479.       -35.    -271.       -0.     89832      231
           920211 104059.94    494.       -28.    -364.        4.     89832      231
           920213 104125.83    520.       -13.    -478.       14.     89832      231

13815      83.04   106.21   -.0004  81 053  HN   304.33    920211
           920211 094258.77    609.        65.     414.        4.     89832      233

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           920211 172923.67  20074.        -0.     132.      -11.     90000      241
           920211 172952.42  20074.        -0.     134.      -11.     90000      241
           920211 173019.24  20074.        -0.     137.      -12.     90000      241
           920211 173159.75  20073.        -1.       0.       20.     90001      241
           920211 173236.93  20073.        -1.       1.       19.     90001      241
           920211 173319.96  20073.        -1.       1.       20.     90001      241
           920211 173345.84  20073.        -1.       1.       20.     90001      241
           920211 173350.45  20074.        -1.    -133.        6.     90002      242
           920211 173433.40  20074.        -1.    -129.        6.     90002      242
           920211 173502.61  20074.        -1.    -127.        6.     90002      242
           920211 173530.30  20074.        -1.    -125.        6.     90002      242
           920211 173616.76  20074.        -1.    -322.        6.     90003      241
           920211 173652.59  20073.        -0.    -119.        5.     89417      241
           920211 173725.84  20073.        -0.    -116.        5.     90003      241
           920211 173743.47  20073.        -0.    -114.        5.     89417      242
           920211 173801.52  20073.        -0.    -113.        5.     90003      241
           920211 173812.63  20073.        -0.    -112.        5.     89417      242
           920211 173841.02  20073.        -0.    -110.        5.     89417      242
           920211 173911.85  20073.        -0.    -107.        5.     89417      242
           920211 174036.02  20073.        -0.    -101.        4.     89417      242
           920211 174100.85  20073.        -0.     -99.        4.     89417      242
           920211 174117.68  20074.        -0.     197.      -21.     89415      241
           920211 174127.77  20073.        -0.     -97.        4.     89417      242
           920211 174144.50  20074.        -0.     200.      -22.     89415      241
           920211 174154.62  20073.        -0.     -95.        4.     89417      242
           920211 174209.95  20074.        -0.     202.      -22.     89415      241
           920211 174235.53  20074.        -0.     205.      -23.     89415      241
           920211 174250.79  20073.        -0.     -90.        3.     89417      242
           920211 174354.95  20074.        -0.     212.      -24.     89415      242
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SAT        INC    PERIOD      DRAG  INTL DESIG     R.A.     EPOCH
           DATE        TIME    ALT         ΔU        ΔV        ΔW        TAG    SENSOR


           920211 174407.61   20073.       -0.       -84.        3.     89417       242
           920211 174419.76   20074.       -0.       214.      -24.     89415       241
           920211 174433.94   20073.       -0.       -82.        3.     89417       242
           920211 174443.66   20074.       -0.       216.      -25.     89415       241
           920211 174459.73   20073.       -0.       -80.        3.     89417       241
           920211 174508.59   20074.       -0.       219.      -25.     89415       241
           920211 174525.20   20073.       -0.       -78.        3.     89417       241
           920211 174633.88   20074.       -0.       226.      -26.     89415       241
           920211 174634.25   20073.       -0.       -72.        2.     89417       242
           920211 174701.55   20074.       -0.       229.      -27.     89415       241
           920211 174711.38   20073.       -0.       -69.        2.     89417       242
           920213 174726.68   20074.       -0.       231.      -27.     89415       241
           920211 174738.50   20073.       -0.       -67.        2.     89417       242
           920211 174751.79   20074.       -0.       234.      -28.     89415       241
           920211 174808.02   20073.       -0.       -65.        2.     89417       241
           920211 174913.11   20074.       -0.       241.      -29.     89415       241
           920211 174940.71   20074.       -0.       243.      -29.     89415       241
           920211 175001.63   20072.       -1.         1.       22.     89416       242
           920211 175006.70   20074.       -0.       246.      -29.     89415       242
           920211 175039.33   20074.       -0.       249.      -30.     89415       241
           920211 175040.69   20072.       -1.         1.       22.     89416       242
           920211 175147.94   20072.       -1.         1.       22.     89416       242
           920211 175257.00   20072.       -1.         3.       22.     89416       242
           920211 175401.07   20072.       -1.         1.       22.     89416       242
           920211 175544.14   20072.       -1.         1.       23.     89416       242
           920211 175610.24   20072.       -1.         1.       23.     89416       242
           920211 175641.24   20072.       -1.         3.       23.     89416       242
           920211 175709.66   20072.       -1.         1.       23.     89416       242
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           920211 175758.10   20073.        0.       -19.       -2.     90004       241
           920211 175828.40   20073.        0.       -16.       -2.     90004       241
           920211 175847.64   20072.       -1.         1.       23.     89416       242
           920211 175859.75   20073.        0.       -14.       -2.     90004       241
           920211 175917.69   20072.       -1.         1.       23.     89416       242
           920211 175951.58   20072.       -1.         1.       23.     89416       242
           920211 180017.19   20072.       -1.         1.       23.     89416       242

13904      27.55    415.79   -.0559  67 001    Y    127.27    920210
           920211 135826.02   11962.      -39.     -1959.       -9.     89298       243
           920211 185858.68   11945.      -38.     -1965.      -26.     89298       243
           920211 185926.40   11930.      -37.     -1970.      -40.     89298       243

13905      23.51    136.45   -.1847  67 001    Z    118.49    920211
           920211 133825.31    1431.     -138.      -911.        8.     94730       399

13907      24.34    340.76   -.0249  67 001   AB    193.36    920211
           920210 223123.74    3018.      838.     -4285.      -42.     89405       242
           920210 223157.03    3163.      750.     -4546.      -37.     89405       242
           920210 223225.69    3287.      665.     -4770.      -32.     89405       242
           920210 223358.66    3661.      335.     -5477.       20.     89407       242
           920210 223430.21    3833.      206.     -5710.      -16.     89407       242
           920210 223458.74    3930.       83.     -5917.      -13.     89407       242

13911      27.95    392.62   -.0191  67 001   AF    311.16    920210
           920211 083534.22    1800.      -37.       -79.       -3.     90000       232

13971      25.95    530.41   -.0649  83 026    D     57.83    920211
           920210 211939.45    2786.    -1161.     -2526.      -39.     89298       221

14034      60.91    717.34    .0061  83 038    A    139.79    920211
           920211 030543.80   10306.    -1083.     12069.       49.     21854       369
           920211 030608.03   10306.    -1057.     12031.       47.     21854       369
           920211 030639.20   10306.    -1027.     11984.       43.     21854       369
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SAT        INC    PERIOD      DRAG  INTL DESIG     R.A.     EPOCH
           DATE       TIME     ALT         ΔU        ΔV        ΔW       TAG   SENSOR


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          920211 030741.14   10306.     -973.    11891.       38.     21854      369
          920211 030819.11   10306.     -944.    11835.       34.     21854      369
          920211 030910.93   10306.     -907.    11752.       28.     21854      369
          920211 031003.22   10306.     -883.    11688.       23.     21854      369
          920211 031034.16   10306.     -870.    11645.       19.     21854      369
          920211 031105.07   10306.     -858.    11604.       16.     21854      369
          920211 031136.06   10306.     -848.    11563.       13.     21854      369

14086       6.01  1424.37  0.0000  83 016    F    59.80    920210
          920211 195321.20   19214.      -27.      999.       33.     82082      243
          920211 195345.85   192141      -27.      999.       34.     82082      243
          920211 195409.30   19214.      -27.      998.       35.     82082      243
          920211 195434.07   19214.      -27.      998.       36.     82082      243
          920210 223733.02   19235.      -50.     1625.        3.     89409      242
          920210 223804.25   19235.      -50.     1625.       -1.     89409      242
          920210 223832.15   19235.      -50.     1525.       -5.     89409      242
          920210 223900.67   19235.      -49.     1624.       -9.     89409      242
          920210 224446.40   19232.      -22.     1122.       47.     89413      242
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          920210 224554.37   19233.      -22.     1120.       40.     89413      242
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          920210 225040.46   19226.       -0.       -1.        8.     89416      242
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          920210 225336.57   19226.       -0.        0.        8.     89417      242
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          920210 230020.69   19233.      -20.     1101.       35.     89413      242
          920210 230113.87   19233.      -20.     1100.       34.     89413      242
          920210 230142.26   19233.      -20.     1009.       34.     89413      242
          920210 230244.97   19233.      -20.     1098.       33.     89413      242
          920210 230314.40   19233.      -20.     1097.       33.     89413      242
          920210 230347.57   19233.      -20.     1096.       32.     89413      242
          920210 230431.24   19233.      -20.     1095.       31.     89413      242
          920210 230559.01   19233.      -20.     1093.       30.     89413      242
          920210 230640.35   19233.      -19.     1093.       30.     89413      242
          920210 230710.23   19233.      -19.     1092.       29.     89413      242
          920210 230740.94   19233.      -19.     1091.       29.     89413      242
          920210 230912.44   19233.      -19.     1089.       27.     89413      242
          920210 230946.67   19233.      -19.     1088.       27.     89413      242
          920210 231016.88   19233.      -19.     1088.       27.     89413      242
          920210 231048.99   19233.      -19.     1087.       26.     89413      242
          920210 232656.94   19234.      -17.     1064.       13.     85413      242
          920210 232721.32   19234.      -17.     1064.       13.     89413      242
          920210 232742.25   19234.      -17.     1063.       13.     89413      242
          920210 232803.48   19234.      -17.     1063.       12.     89413      242
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          920211 172952.42   19203.       -1.        8.       13.     90000      241
          920211 173019.24   19203.       -1.        8.       13.     90000      241
          920211 173159.75   19202.       -2.     -132.       44.     90001      241
          920211 173236.93   19202.       -2.     -135.       44.     90001      241
          920211 173319.96   19202.       -2.     -339.       45.     90001      241
          920211 173345.84   19202.       -2.     -141.       45.     90001      241
          920211 173356.45   19203.       -3.     -269.       31.     90002      242
          920211 173433.40   19203.       -3.     -269.       31.     90002      242
          920211 173502.61   19203.       -3.     -270.       32.     90002      242
          920211 173530.30   19203.       -3.     -270.       32.     90002      242
          920211 173616.76   19203.       -3.     -271.       33.     90003      241
          920211 173652.59   19203.       -3.     -272.       33.     90003      241
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  SAT       INC    PERIOD      DRAG  INTL DESIG    R.A.     EPOCH
           DATE        TIME     ALT         ΔU       ΔV        ΔW        TAG    SENSOR


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          920211 173743.47   19203.        -3.     -272.       33.     89417       242
          920211 173801.52   19203.        -3.     -272.       33.     90003       241
          920211 173812.63   19203.        -3.     -272.       33.     89417       242
          920211 173841.65   19204.        -3.     -273.       34.     89417       242
          920211 173911.53   19204.        -3.     -273.       34.     89417       242
          920211 174036.02   19204.        -3.     -274.       35.     89417       242
          920211 174100.85   19204.        -3.     -274.       35.     89417       242
          920211 174117.68   19205.        -1.        8.       14.     89415       241
          920211 174127.77   19204.        -3.     -275.       35.     89417       242
          920211 174144.50   19205.        -1.        8.       14.     89415       241
          920211 174154.62   19204.        -3.     -275.       35.     89417       242
          920211 174209.95   19205.        -1.        8.       14.     89415       241
          920211 174235.53   19205.        -1.        8.       14.     89415       241
          920211 174250.79   19204.        -3.     -276.       38.     89417       242
          920211 174354.95   19205.        -1.        8.       14.     89415       241
          920211 174407.61   19204.        -3.     -277.       37.     89417       242
          920211 174416.76   19205.        -1.        8.       13.     89415       241
          920211 174433.94   19204.        -3.     -277.       37.     89417       242
          920211 174443.66   19205.        -1.        8.       14.     89415       241
          920211 174459.73   19204.        -3.     -277.       37.     89417       242
          920211 174508.59   19205.        -1.        8.       13.     89415       241
          920211 174525.20   19204.        -3.     -278.       38.     89417       242
          920211 174633.88   19205.        -1.        8.       14.     89415       241
          920211 174634.25   19204.        -3.     -278.       38.     89417       242
          920211 174701.55   19205.        -1.        8.       13.     89415       241
          920211 174711.38   19204.        -3.     -279.       38.     89417       242
          920211 174726.68   19205.        -1.        8.       14.     89415       241
          920211 174738.50   19204.        -3.     -279.       39.     89417       242
          920211 174751.79   19205.        -1.        8.       13.     89415       241
          920211 174808.02   19204.        -3.     -279.       39.     89417       242
          920211 174913.11   19205.        -1.        8.       14.     89415       241
          920211 174940.73   19206.        -1.        8.       14.     89415       241
          920211 175006.70   19206.        -1.        8.       14.     89415       241
          920211 175039.33   19206.        -1.        8.       14.     89415       241
          920211 175728.50   19205.        -4.     -287.       44.     90004       241
          920211 175758.10   19205.        -4.     -287.       44.     90004       241
          920211 175828.40   39205.        -4.     -287.       45.     90004       241
          920211 175859.75   19205.        -4.     -287.       45.     90004       241

14096     72.31    119.11     .0000  83 051   B    79.77    920211
          920211 064649.66     443.         7.     -155.        1.     89871       231

14131     63.22    247.78    -.0047  81 088   G    45.80    920211
          920129 235803.60     683.       127.      798.      -15.     88788       398
          920211 052037.05     566.      -185.      333.      -30.     89324       232
          920211 052102.97     606.      -163.      264.      -15.     89324       232
          920211 052128.54     652.      -137.      199.       -4.    89324.       232

14136     25.31    623.69    -.0308  83 059   E   207.34    920210
          920131 234103.31     886.      -904.     3336.       -5.     88032       398
          920131 234134.18     841.      -908.     3263.       49.     88032       398

14167     46.52    177.10    -.1114  83 066   E   296.87    920212
          920211 093948.48    3777.      -131.     -703.      -26.     89832       232
          920211 094011.52    3764.      -135.     -743.      -14.     89832       232

14176     74.02    115.38    -.0000  83 069   F    97.52    920211
          920211 191315.07     780.       -27.     -316.       -5.     95222       393

14195      8.79   1436.60    0.0000  81 102   F    58.16    920211
          920211 103954.72   19169.      -219.    -1670.       41.     89832       231
          920211 104037.63   19168.      -219.    -1664.       19.     89832       231
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SAT        INC   PERIOD     DRAG  INTL DESIG     R.A.    EPOCH
          DATE     TIME      ALT         ΔU        ΔV       ΔW       TAG   SENSOR


         920211 104059.94   19168.     -218.    -1660.       8.    89832      231
         920211 104125.83   19168.     -218.    -1656.      -6.    89832      231
         920211 104155.42   19108.     -213.    -1652.     -19.    89832      231

14236    22.73    224.61   -.0475  63 077   C    96.03   920211
         920211 055928.29     124.     -134.     -675.     -20.    94700      399

14240    74.06    100.62   -.0001  83 070   A   257.76   920212
         920211 053905.00     422.       -4.        5.      15.    89812      232

14356    82.80     98.88   -.0085  81 053  HS   247.60   920211
         920211 052037.05     341.     -146.     -867.       5.    89324      232
         920211 052102.97     389.     -138.    -1033.      19.    89324      232

14362    82.83     95.52   -.0501  81 053  HY   253.89   920209
         920211 020456.34     282.       -8.      249.       1.    14362      396
         920211 020506.16     282.       -8.      249.       1.    14362      396
         920211 020516.03     282.       -8.      249.       1.    14362      396
         920211 124613.90     291.      -16.      313.      -1.    14362      399
         920211 124626.53     291.      -16.      313.      -0.    14362      399
         920211 124642.45     291.      -15.      333.      -0.    14362      399
         920211 124656.10     291.      -16.      313.      -0.    14362      399

14401    74.05    100.73   -.0001  83 103   A   276.39   920212
         920211 154301.95     418.     -183.    -1129.       8.    19261      399
         920211 154334.42     418.     -183.    -1129.       8.    19261      399
         920211 154408.01     418.     -182.    -1128.       8.    19261      399
         920211 154412.62     417.     -183.    -1127.       8.    19261      399

14410    62.22    110.08   -.0031  68 091  CL    56.51   920212
         920211 095954.57     589.      170.      570.     -18.    93937      396
         920211 100004.44     588.      179.      496.       6.    93937      396

14416    68.22    107.85   -.0067  68 091  CS   185.77   920210
         920128 233002.62     808.     -333.    -2013.     -16.    88892      398

14420    62.28    105.04   -.0034  68 097  EB     8.62   920212
         920210 224225.01     819.      315.    -1050.     -19.    89412      242

14445    66.48    104.80   -.0016  77 121  BH   254.19   920211
         920211 004827.72     523.     -261.     1221.     -13.    81575      399

14467    99.95    106.12   -.0004  70 025  NT   130.61   920211
         920211 184253.95     571.     -343.    -1636.     -14.    93983      396

14478   100.56    120.12   -.0035  70 025  NW   138.46   920211
         920211 091049.88    1023.        4.      -16.     -14.    89376      232

14483    82.92    107.28   -.0017  83 111   A   321.21   920211
         920211 121911.27     357.      -50.    -1102.     -14.    86626      329
         920211 103954.72     376.      142.      399.      11.    89832      231

14496    29.20    108.70   -.0059  77 065  FM   359.95   920212
         920211 083016.70     371.      -76.     -121.      -8.    89336      232
         920211 083244.24     383.     -154.     -684.       1.    89336      232

14501    65.78    107.93   -.0082  76 126  BN   160.67   920211
         920211 000514.37     624.     -167.      820.      -5.    86734      329

14503    65.86    117.63   -.0005  76 126  80   195.15   920211
         920128 114546.87    1006.       13.    -1719.      18.    21223      383
         920211 090537.90    1089.      -48.    -2134.      -8.    90436      385
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 SAT       INC   PERIOD      DRAG  INTL DESIG    R.A.     EPOCH
          DATE        TIME    ALT         ΔU       ΔV       ΔW       TAG   SENSOR


14512    65.74    133.79   -.0000  77 012   K    36.36   920109
        920211 094315.63    1223.     -272.   -2591.      10.    89376      232

14514   109.94    105.08   -.0309  76 039   D   344.77   920211
        920211 215722.80     522.      271.     594.      11.    95283      393
        920211 215900.43     514.      276.    -246.       5.    95283      393
        920211 220036.70     507.      106.   -1056.       1.    95283      393
        920211 220213.80     500.     -232.   -1818.      -4.    95283      393

14515    90.29    111.34   -.0001  65 027   M   103.15   920211
        920211 033825.09     712.     -222.   -1368.       3.    93901      396
        920211 033834.96     711.     -222.   -1368.       3.    93901      396
        920211 033844.86     711.     -222.   -1368.       3.    93901      396
        920211 033854.70     711.     -222.   -1368.       3.    93901      396
        920211 033904.59     711.     -222.   -1368.       3.    93901      396

14524    23.98    566.51   -.0404  83 089   C   142.70   920211
        920211 110935.35     337.       93.    -561.     -29.    94716      399
        920211 110959.58     344.       82.    -571.      -4.    94716      399
        920211 111025.10     353.       71.    -582.      22.    94716      399

14528    29.57    106.37   -.0037  63 047   Q   165.29   920211
        920211 131850.04     809.     -268.    2350.      19.    90233      383
        920211 131900.09     827.     -249.    2353.      -8.    90233      383

14555    83.10    100.46   -.0053  81 053  JN    32.91   920211
        920211 194610.19     423.      -47.     733.       5.    86622      329

14556    83.02    106.64   -.0007  81 053  JP   314.63   920211
        920211 171336.64     585.     -320.    1696.      16.    94742      399

14557    62.82    104.44   -.0014  81 053  JO   126.59   920211
        920211 051519.34     516.      -67.    -645.      -1.    18601      399
        920211 051523.71     516.      -67.    -645.      -1.    18601      399
        920211 051538.43     517.      -67.    -644.      -1.    18601      399
        920211 051554.33     517.      -67.    -644.      -1.    18601      399
        920211 051609.32     517.      -67.    -643.      -1.    18601      399

14565    29.21    117.09   -.0002  77 065  FR   254.59   920211
        920211 133658.51    1269.     -404.    3020.      21.    94730      399

14568    62.90    103.50   -.0013  83 001   C    12.74   920211
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14590    66.35    675.74    .0003  83 127   A    19.64   920210
        920210 223358.66   10331.     -668.   -4332.     -39.    89407      242
        920210 223430.21   10333.     -083.   -4363.     -11.    89407      242
        920210 223458.74   10335.     -697.   -4429.      15.    89407      242

14591    66.36    675.73    .0000  83 127   B    19.63   920210
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        920210 223430.21   10387.     -823.   -4876.      -6.    89407      242
        920210 223458.74   10390.     -838.   -4922.      20.    89407      242

14608    51.60    331.72   -.0093  83 127   H   230.89   920211
        920211 050948.16    1027.      451.    1764.      37.    89376      232

14618    74.01    115.69   -.0000  84 001   H   117.00   920211
        920211 172857.63     827.      -20.     506.      19.    90000      241
        920211 172923.67     807.      -29.     402.      10.    90000      241
        920211 172952.42     795.      -32.     292.       0.    90000      241
        920211 173019.24     793.      -28.     192.      -8.    90000      241
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SAT       INC    PERIOD    DRAG  INTL DESIG    R.A.    EPOCH
         DATE       TIME    ALT        ΔU        ΔV       ΔW      TAG  SENSOR

14621    88.91    398.26    .0016 81 070   K   140.96   920203
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14624    82.93    105.00   -.0000 84 003   A    34.38   920212
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        920210 211850.51     517.       -29.     181.      11.   89298     221
        920210 211939.45     538.        -5.      -3.      -4.   89298     221

14665    28.25    152.13   -.3904 84 005   C   220.89   920211
        920211 220610.58     276.         8.     -15.      -1.   90251     382

14693    28.15     96.04   -.0026 84 011   E   244.12   920211
        920131 052028.33     445.      -287.   -2049.       8.   88788     398

14694    27.68     98.11   -.0013 84 011   F   273.60   920211
        920211 202057.32     264.      -220.    -500.      17.   90249     383
        920211 220612.01     268.      -345.     838.       8.   94745     399

14699    82.54     97.16   -.0004 84 013   A   125.10   920211
        920211 095438.82     354.        18.      68.      13.   89832     232

14715    90.29    111.42    .0001 65 027   N   101.40   920211
        920211 073534.40     699.      -267.    1443.       7.   89812     232

14783     6.77   1438.20   0.0000 84 022   A    73.75   920211
        920210 223052.30   19336.        -0.       4.       7.   89405     242
        920210 223123.74   19336.        -0.       4.       8.   89405     242
        920210 223157.03   19336.        -0.       4.       7.   89405     242
        920210 223225.69   19336.        -0.       4.       7.   89405     242
        920210 223358.66   19336.        -0.       4.       7.   89407     242
        920210 223430.21   19336.        -0.       4.       7.   89407     242
        920210 223458.74   19336.        -0.       4.       7.   89407     242
        920210 223607.20   19336.        -0.       4.       7.   89407     242
        920210 223733.02   19362.       -84.   -2231.     -25.   89409     242
        920210 223804.25   19362.       -83.   -2231.     -32.   89409     242
        920210 223832.15   19362.       -83.   -2231.     -38.   89409     242
        920210 223900.67   19363.       -83.   -2232.     -44.   89409     242
        920210 224446.40   19361.      -140.   -2729.      11.   89413     242
        920210 224519.31   19361.      -139.   -2729.       8.   89413     242
        920210 224554.37   19361.      -139.   -2729.       5.   89413     242
        920210 224624.95   19361.      -139.   -2730.       3.   89413     242
        920210 224923.21   19355.      -308.   -3344.      -3.   89416     242
        920210 224954.97   19355.      -308.   -3844.      -5.   89416     242
        920210 225040.46   19355.      -308.   -3343.      -8.   89416     242
        920210 225117.77   19355.      -308.   -3843.     -11.   89416     242
        920210 225302.73   19355.      -307.   -3842.     -17.   89417     242
        920210 225336.57   19355.      -307.   -3841.     -19.   89417     242
        920210 225410.08   19355.      -307.   -3843.     -21.   89417     242
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14825    64.76    717.28    .0057 84 029   A   105.38   920209
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        920211 120844.16    5212.       191.    3149.      11.   83999     222

14839    28.99    122.08   -.0005 77 065  FS    92.11   920211
        920211 051618.88     792.      -236.     467.      12.   94699     399

14900    30.48    624.88   -.0065 84 035   8    83.45   920211
        920211 120229.50    3922.       -17.     283.     -12.   83999     222

14909    98.73    105.57   -.0018 78 026  GJ    50.53   920212
        920211 223247.69     623.      -235.   -1638.       0.   90462     385
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SAT        INC   PERIOD      DRAG  INTL DESIG     R.A.      EPOCH
           DATE       TIME    ALT        ΔU         ΔV        ΔW        TAG    SENSOR


14910     99.06    102.52   -.0009  78 026  GK     2.07    920211
          920211 100130.79    493.      -386.     1733.      -13.     93938       396

14913     98.95    102.09   -.0009  78 026  GN    29.11    920231
          920211 205758.46    447.       -78.     -432.       10.     94000       396

14925     82.88    103.87   -.0014  81 053  KA   107.51    920211
          920211 031835.67    493.       -47.     -371.      -12.     94687       399

14978     66.33    675.74    .0004  84 047   B    19.55    920210
          920210 223358.66  10277.      -232.      -22.      -22.     89407       242
          920210 223430.21  10276.      -242.    -2335.        6.     89407       242
          920210 223458.74  10275.      -251.    -2382.       31.     89407       242
          920210 225947.88  10356.     -1070.    -5420.       44.     89413       242

15027     65.97    717.57   0.0000  84 055   A   141.57    920211
          920211 041331.80  10316.     -1233.    10244.       -2.     21854       404
          920211 041412.94  10313.     -1269.    10212.        4.     21854       404
          920211 041454.07  10317.     -1318.    10202.      -21.     21854       404
          920211 041535.20  10316.     -1360.    10178.      -20.     21854       404
          920211 041616.34  10315.     -1393.    10146.      -39.     21854       404

15053     52.14    333.00   -.0061  84 647   G     2.05    920211
          920211 130111.60    239.      -784.     1197.       30.     94139       393

15054     51.99    314.38   -.0201  84 047   H   310.71    920210
          920211 123751.07   3533.       518.     1455.        5.     88629       334

15157     28.79    235.67   -.1178  84 080   C   240.28    920211
          920206 142740.82   1911.      -101.    -1333.        9.     15390       398

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          920211 180123.28  18216.      -683.    11173.      -50.     83410       369
          920211 180123.26  18216.      -663.    11173.      -50.     83421       369
          920211 180316.94  18166.      -786.    11118.      -15.     83410       369
          920211 180316.94  18166.      -786.    11118.      -15.     83421       369
          920211 180510.43  18116.      -887.    11060.       22.     83410       369
          920211 180510.43  18116.      -887.    11060.       22.     83421       369

15205     28.73    132.91   -.0004  84 088   E    73.31    920211
          920211 102223.01    865.       298.      189.      -21.     94491       399

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          920210 195202.62  16533.        36.     1722.       22.     89207       221
          920210 195250.54  16592.        35.     1716.       21.     89207       221
          920210 195337.45  16650.        36.     1711.       20.     89207       221
          920210 195530.57  16786.        37.     1668.       16.     89207       221
          920210 195619.21  16847.        37.     1692.       15.     89207       221
          920210 195818.76  16991.        37.     1678.       12.     89207       221
          920210 195928.38  17074.        37.     1569.       10.     89207       221
          920210 200204.24  17259.        38.     1653.        6.     89207       221
          920210 200301.26  17326.        38.     1646.        4.     89207       221
          920210 200400.54  17396.        38.     1640.        3.     89207       221
          920210 200504.94  17471.        38.     1634.        0.     89207       221
          920210 201942.02  18453.        41.     1548.      -22.     89207       221
          920210 202051.21  16527.        41.     1541.      -25.     89207       221
          920210 202159.98  18601.        41.     1534.      -26.     89207       221
          920210 202258.95  18663.        41.     1529.      -28.     89207       221
          920211 085933.98   2196.      -377.     2942.      -42.     90000       951
          920211 085949.03   2198.      -380.     2893.      -45.     90000       951
          920211 090003.68   2200.      -383.     2846.      -49.     90000       951
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  SAT       INC   PERIOD      DRAG  INTL DESIG     R.A.     EPOCH
           DATE      TIME      ALT          ΔU       ΔV        ΔW        TAG   SENSOR


 15214    63.87   735.25   -.0096  84 089   A     69.50    920211
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 15246    24.91   642.17   -.0295  84 093   G    106.94    920210
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         920211 175709.66   17289.       -746.    -6519.      26.     89416      242
         920211 175728.50   17277.       -750.    -6532.       3.     90004      241
         920211 175758.10   17256.       -745.    -6513.     -14.     90004      241
         920211 175828.40   17234.       -740.    -6495.     -30.     90004      241
         920211 175847.64   17220.       -732.    -6464.     -26.     89416      242
         920211 175859.75   17212.       -735.    -6475.     -48.     90004      241
         920211 175917.69   17198.       -728.    -6447.     -41.     89416      242

 15267    67.64   718.21   -.0068  84 096   A    311.52    920210
         920211 050842.67   19424.      -1244.     6868.      31.     89376      232

 15340    90.29   111.34    .0001  65 027   R    103.00    920211
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 15378    64.99   104.11   -.0000  84 112   A    123.98    920211
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         920131 192511.63     493.       -104.      869.      -8.     19881      398
         920131 192519.13     483.       -115.      874.      -5.     19881      398

 15390    27.07   261.42   -.0068  84 113   E     77.62    920202
         920204 143150.82    1831.         18.       41.       0.     15390      398
         920204 143311.92    1971.         18.       40.       1.     15390      398
         920204 143440.96    2123.         17.       41.      -1.     15390      398
         920204 143609.11    2274.         17.       39.      -1.     15390      398
         920204 143739.51    2428.         17.       38.      -1.     15390      398
         920204 143907.98    2578.         16.       37.      -1.     15390      398
         920204 220712.12    3829.        -22.       39.      -3.     15390      398
         920204 220752.68    3770.        -20.       31.       1.     15390      398
         920204 220811.06    3743.        -20.       37.       2.     15390      398
         920205 025047.47    1640.        -25.       57.       0.     15390      398
         920205 025219.91    1483.        -26.       57.       0.     15390      398
         920205 025353.20    1327.        -25.       59.      -0.     15390      398
         920205 025553.06    1132.        -25.       62.      -0.     15390      398
         920205 025753.48     945.        -23.       64.      -0.     15390      398
         920205 025953.06     770.        -21.       66.       0.     15390      398
         920205 120903.59     882.         25.       82.      -1.     15390      398
         920205 121100.27    1061.         28.       78.      -0.     15390      398
         920205 121300.22    1253.         29.       76.      -0.     15390      398
         920205 121500.09    1452.         30.       73.       0.     15390      398
         920205 121700.69    1655.         30.       71.      -0.     15390      398
         920205 121901.77    1863.         30.       69.      -0.     15390      398
         920206 050941.81     638.        -35.      116.       0.     15390      398
         920206 094834.08     347.         21.      137.      -0.     15390      398
         920206 094932.81     402.         24.      135.      -0.     15390      398
         920206 095035.66     467.         27.      133.      -0.     15390      398
         920206 095138.79     540.         29.      131.      -0.     15390      398
         920206 095242.03     618.         32.      128.      -0.     15390      398
         920206 095345.03     700.         34.      126.       0.     15390      398
         920206 142622.62    1776.         47.      109.      -2.     15390      398
         920206 142740.82    1911.         46.      107.      -2.     15390      398
         920206 142907.99    2061.         48.      105.      -1.     15390      398
         920206 143035.10    2210.         48.      101.      -2.     15390      398
         920206 143201.50    2359.         49.       98.      -1.     15390      398
         920206 143330.85    2511.         48.       98.      -1.     15390      398
         920207 072808.50     167.        -11.      194.      -0.     15390      398
         920207 072826.65     166.         -9.      194.      -0.     15390      398
         920207 072845.71     165.         -8.      194.       0.     15390      398
         920207 072904.82     166.         -6.      194.       0.     15390      398
 SAT        INC   PERIOD     DRAG  INTL DESIG    R.A.     EPOCH
            DATE      TIME     ALT        ΔU        ΔV        ΔW      TAG     SENSOR


          920207 072924.02  167.       -4.     195.        0.     15390       398
          920207 072943.26  169.       -2.     194.       -1.     15390       398
          920207 120331.15  840.       53.     178.       -1.     15390       398
          920207 120527.37 1016.       58.     171.        0.     15390       398
          920207 120727.41 1207.       61.     164.        0.     15390       398
          920207 120932.79 1412.       63.     158.       -1.     15390       398
          920207 121128.11 1608.       65.     151.       -1.     15390       398
          920207 121329.30 1813.       65.     147.       -2.     15390       398
          920208 050436.75  632.      -72.     222.        0.     15390       398
          920208 050528.32  567.      -69.     226.       -0.     15390       398
          920208 050624.96  500.      -65.     230.       -0.     15390       398
          920208 050722.33  437.      -61.     234.       -0.     15390       398
          920208 050819.64  380.      -57.     237.       -0.     15390       398
          920208 050917.26  328.      -52.     241.       -0.     15390       398
          920208 094258.60  326.       31.     260.       -1.     15390       398
          920208 094403.72  384.       38.     257.       -1.     15390       398
          920208 094512.84  455.       45.     252.        0.     15390       398
          920208 094622.12  533.       51.     248.       -1.     15390       398
          920208 094731.68  619.       57.     243.       -1.     15390       398
          920208 094840.97  710.       62.     238.       -1.     15390       398
          920208 215222.16 4229.      -84.     146.        4.     15390       398
          920208 215414.76 4069.      -86.     151.        5.     15390       398
          920208 215615.65 3890.      -90.     153.        0.     15390       398
          920208 215817.34 3708.      -93.     157.        0.     15390       398
          920208 220048.70 3475.      -96.     162.       -1.     15390       398
          920208 220252.49 3276.     -103.     170.       -7.     15390       398
          920209 023657.23 1795.     -113.     221.       -0.     15390       398
          920209 024051.34 1601.     -113.     229.        1.     15390       398
          920209 024252.58 1396.     -112.     238.        1.     15390       398
          920209 024451.13 1201.     -110.     248.        0.     15390       398
          920209 024650.96 1012.     -106.     258.        1.     15390       398
          920209 024851.13  830.     -102.     269.       -0.     15390       398
          920209 072238.54  166.      -29.     339.       -0.     15390       398
          920209 072252.99  167.      -27.     339.       -0.     15390       398
          920209 072312.52  166.      -24.     340.       -0.     15390       398
          920209 072332.67  166.      -21.     340.       -0.     15390       398
          920209 072351.04  166.      -18.     340.       -1.     15390       398
          920209 072410.52  168.      -15.     340.       -1.     15390       398
          920209 115754.19  817.       86.     311.       -1.     15390       398
          920209 115924.96  952.       93.     302.       -1.     15390       398
          920209 120059.77 1099.       96.     292.       -2.     15390       398
          920209 120234.81 1252.      103.     284.       -1.     15390       398
          920209 120409.88 1410.      107.     274.       -0.     15390       398
          920209 120544.80 1568.      109.     267.       -1.     15390       398
          920210 045915.51  622.     -129.     371.        0.     15390       398
          920210 093716.01  316.       37.     438.       -3.     15390       398
          920210 093807.19  360.       47.     434.       -1.     15390       398
          920210 093902.39  414.       57.     429.       -0.     15390       398
          920210 093957.67  472.       67.     424.       -1.     15390       398
          920210 094052.78  535.       75.     418.       -0.     15390       398
          920210 094148.35  603.       84.     411.       -1.     15390       398

15392     21.50     115.76   -.0001  84 315   8    83.95    920211
          920211 113658.87 1017.     -241.    2077.       10.     90447       385

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          920211 035934.63  707.      -98.     902.       16.     19185       396
          920211 035944.50  706.      -98.     902.       16.     19185       396
          920211 035954.40  706.      -98.     902.       16.     19185       396

15530     90.29     111.36   -.0002  65 027   T   102.94    920211
          920211 035934.63  707.      -46.    -648.      -13.     19185       396
          920211 035944.50  706.      -46.    -548.      -13.     19185       396
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  SAT        INC   PERIOD      DRAG  INTL DESIG     R.A.     EPOCH
            DATE      TIME      ALT         ΔU       ΔV        ΔW       TAG    SENSOR


          920211 035954.40     706.      -45.     -648.      -13.     19185       396

15555      65.00    115.64   -.0004  76 126  BT   133.22    920211
          920211 191315.07     780.      113.     1520.       20.     95222       393

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          920129 235638.11     622.     -878.     2280.      -29.     88788       398
          920129 235722.03     751.     -865.     2258.       -6.     88788       398
          920129 235803.60     683.     -863.     2246.       11.     88788       398

15596     108.06    100.33   -.0002  85 021   B    42.97    920212
          920211 043719.26     444.       10.     -197.      -14.     86777       329

15679       7.17    485.15   -.0565  65 035   C     3.25    920208
          920211 175001.63   13042.     -428.     4501.      -49.     89416       242
          920211 175040.09   13031.     -426.     4491.      -45.     89416       242
          920211 175147.94   12958.     -423.     4472.      -33.     89416       242
          920211 175257.00   12903.     -420.     4452.      -31.     89416       242
          920211 175401.07   12851.     -417.     4433.      -24.     89416       242
          920211 175544.14   12766.     -412.     4401.      -14.     89416       242
          920211 175630.24   12744.     -410.     4392.      -11.     89416       242
          920211 175641.24   12718.     -409.     4382.       -8.     89416       242
          920211 175709.66   12694.     -407.     4373.       -5.     89416       242
          920211 175728.50   12679.     -402.     4355.      -20.     90004       241
          920211 175758.10   12654.     -401.     4347.      -38.     90004       241
          920211 175828.40   12628.     -400.     4338.      -14.     90004       241
          920211 175847.64   12611.     -402.     4340.        4.     89416       242
          920211 175859.75   12603.     -398.     4329.      -12.     90004       241
          920211 175917.69   12585.     -400.     4329.        7.     89416       242
          920211 175951.58   12555.     -398.     4317.       10.     89416       242
          920211 180017.19   12533.     -397.     4308.       13.     89416       242

15680       6.69    304.49    .0006  85 035   D    21.62    920208
          920210 224108.97    3971.     -395.     5397.       23.     89412       242
          920210 224146.21    3851.     -302.     5201.        8.     89412       242
          920210 224225.01    3725.     -209.     4995.       -8.     89412       242
          920210 224301.19    3607.     -128.     4800.      -23.     89412       242
          920210 224446.40    3251.      123.     4163.      -37.     89413       242
          920210 230946.67    3028.      300.    -4867.      -28.     89413       242
          920210 231016.88    3150.      186.    -5107.      -11.     89413       242
          920210 231048.99    3280.       53.    -5360.        7.     89413       242

15741      64.05    732.26   -.0018  85 040   0    20.62    920211
          920211 090946.74    1204.    -1365.    -2172.       31.     90438       385

15758      62.28    101.03   -.0018  68 091  CZ   201.07    920130
          920211 104746.33     568.     -124.     1056.        1.     15758       396
          920211 104756.20     569.     -124.     1056.        0.     15758       396
          920211 104806.07     570.     -124.     1055.        0.     15758       396

15764      90.48    105.84   -.0001  73 081   C    56.78    920212
          920211 111706.68     648.      -12.     1141.       15.     94717       399

15767      82.93    103.70   -.0020  81 053  KF   131.47    920211
          920211 061147.69     490.      -41.     -541.      -15.     93915       396
          920211 061157.56     490.      -41.     -541.      -14.     93915       396
          920211 061207.43     489.      -41.     -541.      -14.     93915       396
          920211 061217.30     489.      -41.     -541.      -13.     93915       396

15783      67.05    101.04   -.0013  61 OMI 271   121.36    920211
          920211 100130.79     493.     -126.     1261.       -6.     93938       396

15789     103.17    121.03   -.0002  73 066  GS   207.85    920211
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             DATE       TIME    ALT         ΔU       ΔV       ΔW        TAG    SENSOR


           920211 203800.34    1154.     -380.     2519.       13.     7015       399

 15826        .02  1436.13   0.0000  65 048   D  219.714   920211
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           920211 085949.03   19327.        2.      -20.       -2.    90000       951
           920211 090003.68   19327.        2.      -20.       -2.    90000       951
           920211 090018.48   19327.        2.      -20.       -2.    90000       951

 15832     25.32   626.25   -.0062  85 048   F   101.77   920211
           920211 044219.88     840.      259.      240.        3.    94695       399

 15836     26.82   619.19   -.0066  85 048   G    94.01   920211
           920210 200459.89    1287.    -1100.    -2044.       13.    82080       222
           920210 200554.17    1392.    -1235.    -2304.      -29.    82080       222
           920211 055820.39     125.    -1189.     2345.       25.    94700       399
           920211 055826.67     125.    -1160.     2321.       -1.    94700       399

 15916     64.47   737.91   -.0008  65 061   0   299.47   920211
           920211 173725.84   11565.    -1054.     7671.      -33.    90003       241
           920211 173743.47   11534.    -1043.     7639.      -16.    89417       242
           920211 173801.52   11502.    -1032.     7606.        2.    90003       241
           920211 173812.63   11482.    -1026.     7585.       13.    89417       242
           920211 173841.65   11430.    -1006.     7531.       41.    89417       242

 15935     89.91   107.92   -.0001  85 066   A    34.38   920212
           920210 094148.35     603.     -152.      797.        6.    15390       398
           920211 064807.63     583.      -32.      512.       -8.    90000       329
           920211 083930.42     609.      -19.      537.      -12.    90000       329
           920211 193756.79     638.      -33.      522.        6.    90000       329
           920211 212117.31     627.      -27.      525.        8.    90000       329
           920211 212219.81     626.      -31.      522.      -12.    90024       329
           920211 212322.30     623.      -40.      530.        1.    90000       329

 15938     89.91   107.94   -.0000  85 006   C    34.01   920211
           920208 094731.68     619.     -232.    -1162.      -11.    15390       398

 15986     64.68   103.89   -.0000  85 075   A   191.27   920211
           920211 220345.70     494.     -352.    -1642.        2.    95283       393

 15994       .01  1436.12   0.0000  85 076   C   153.12   920210
           920211 085933.98   19233.     -123.     1158.       -5.    90000       951
           920211 085949.03   19233.     -123.     1158.       -5.    90060       951
           920211 090003.68   19233.     -123.     1157.       -5.    90000       951
           920211 090018.48   19233.     -123.     1157.       -5.    90000       951

 16106     66.84   703.63   -.0002  85 088   0   356.94   920211
           920211 201133.77   11571.     -159.    -9969.       39.    83410       369
           920211 201229.93   11494.     -368.    -9989.      -11.    83410       369

 16137     63.72   366.24   -.0006  85 093   B   108.12   920211
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           920211 091118.27    1062.     -274.    -1905.      -30.    93931       396
           920211 091121.25    1062.     -273.    -3909.      -27.    93931       396

 16209     65.84   104.52   -.0001  62 055   L    46.85   920212
           920211 052102.97     508.      -20.       29.      -10.    89324       232
           920211 052128.54     552.       23.      -29.        6.    89324       232

 16214      4.28  1431.15   0.0000  85 102   D    67.85   920210
           920211 120229.50   19311.        1.      -14.        8.    83999       222
           920211 120320.58   19331.        2.      -17.        9.    83999       222
           920211 120406.11   19311.        2.      -15.        9.    83999       222
           920211 120503.94   19311.        2.      -14.        9.    83999       222
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SAT          INC    PERIOD      DRAG  INTL DESIG      R.A.      EPOCH
             DATE         TIME       ALT          ΔU        ΔV         ΔW        TAG    SENSOR


            920211 120805.44    19311.         2.      -15.         9.     83999       222
            920211 120844.16    19311.         2.      -18.        10.     83999       222
            920211 121000.75    19310.         2.      -16.        10.     83999       222
            920211 121038.61    19310.         2.      -16.        10.     83999       222
            920211 121159.66    19310.         2.      -16.         9.     83999       222
            920211 144012.71    19281.         3.      -17.        20.     83999       221
            920211 144034.02    19281.         3.      -17.        20.     83999       221
            920211 144053.94    19281.         3.      -17.        20.     83999       221
            920211 144114.03    19281.         3.      -17.        20.     83999       221

16229       26.95    275.80    -.0077  85 028    E     83.92     920206
            920211 110625.25      345.      -573.      2147.        18.     94716       399

16262       82.50     97.07    -.0005  85 108    A    115.75     920211
            920211 091752.36      322.        -9.       -42.         0.     89832       232
            920211 091818.53      324.        -9.      -148.        -5.     89832       232
            920211 091839.88      338.         0.      -239.         1.     89832       232

16268       82.72    114.98    -.0001  85 094    M     27.05     920212
            920210 195250.54      747.       -11.       166.       -16.     89207       221
            920210 195337.45      753.        -0.       -14.        -7.     89207       221

16375       65.84    104.44    -.0000  82 055    P     24.23     920212
            920211 061147.69      490.      -100.      -678.        -0.     93915       396

16390       70.98    105.11    -.0001  85 097    D     11.92     920213
            920211 061217.30      489.        36.        78.        -9.     93915       396
            920211 080708.77      490.       -94.       929.       -15.     94707       399

16391       71.01    104.78    -.0002  85 097    E    347.49     920212
            920211 205728.86      456.      -217.     -1294.        13.     94000       396

16396       66.10    675.73     .0006  85 118    A     18.93     920210
            920210 223052.30    10287.      -211.     -2162.       -48.     89405       242
            920210 223123.74    10286.      -221.     -2214.       -20.     89405       242
            920210 223157.03    10285.      -231.     -2268.        10.     89405       242
            920210 223225.69    10284.      -240.     -2315.        35.     89405       242
            920210 225805.88    10355.     -1169.     -5623.       -32.     89415       242

16497        4.36   1457.33    0.0000  86 007    A     69.51     920211
            920211 120229.50    19686.       -35.       535.       -16.     83999       222
            920211 120320.58    19686.       -35.       535.       -16.     83999       222
            920211 120406.11    19686.       -35.       538.       -15.     83999       222
            920211 120503.94    19686.       -35.       543.       -15.     83999       222
            920211 120805.44    19685.       -36.       550.       -16.     83999       222
            920211 120844.16    19685.       -36.       550.       -16.     83999       222
            920211 121000.75    19685.       -36.       555.       -16.     83999       222
            920211 121038.63    19685.       -37.       556.       -16.     83999       222
            920211 121159.66    19684.       -37.       560.       -17.     83999       222
            920211 144012.71    19621.       -79.       993.       -39.     83999       221
            920211 144034.02    19621.       -79.       994.       -39.     83999       221
            920211 144053.94    19621.       -79.       995.       -39.     83999       221
            920211 144114.03    19621.       -79.       996.       -39.     83999       221

16527       63.88    717.48    -.0053  86 011    A     84.37     920211
            920211 051456.85     2181.      -344.      2724.       -44.     89810       232
            920211 051518.85     2164.      -329.       538.       -33.     89810       232
            920211 051620.84     2120.      -288.      2378.        -3.     89810       232
            920211 051646.07     2106.      -274.      2274.         7.     89810       232
            920211 051741.41     2033.      -247.      2053.        23.     89810       232
            920211 051804.41     2076.      -238.      1963.        28.     89810       232
            920211 051823.71     2072.      -231.      1888.        31.     89810       232
            920211 051847.93     2069.      -223.      1798.        33.     89810       232
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 SAT        INC   PERIOD     DRAG  INTL DESIG    R.A.     EPOCH
            DATE      TIME     ALT        ΔU       ΔV       ΔW       TAG   SENSOR


16533     63.97    705.74   0.0000  86 011   F    83.02    920210
          920211 091049.88    9225.       101.    -482.      -48.    89376      232
          920211 091113.51    9262.       103.    -497.      -41.    89376      232
          920211 091134.08    9295.       104.    -511.      -35.    89376      232
          920211 091202.36    9339.       105.    -530.      -27.    89376      232

16615     98.52    100.42   -.0017  86 019   C   111.90    920211
          920211 083306.92     398.      -204.    1141.       -2.    89336      232

16719     82.55     97.05   -.0006  86 034   A   189.97    920211
          920210 205626.24     315.      -356.    1551.        3.    19994      399

16720     82.56     97.46   -.0002  86 034   B   195.03    920211
          920210 093807.19     360.       -41.    -647.        3.    15390      398

16939     64.78    731.31    .0041  86 068   C   133.91    920209
          920211 125157.84    3761.     -1362.    6171.       42.    88769      334

16953     74.01    100.45   -.0002  86 070   B     4.31    920211
          920211 080552.99     397.      -127.     880.      -17.    94707      399

16963     64.64    675.74    .0003  86 071   C   139.35    920210
          920211 050100.73   10324.       -20.     620.      -40.    21854      369
          920211 050142.24   10324.       -21.     620.      -43.    21854      369
          920211 050213.09   10324.       -20.     620.      -45.    21854      369
          920211 050242.85   10324.       -20.     620.      -47.    21854      369
          920211 050313.59   10324.       -20.     620.      -48.    21854      369
          920211 050350.93   10325.       -20.     620.      -49.    21854      369

16968     64.85    675.21   -.0004  86 071   F   139.25    920211
          920211 050100.73   10324.      -117.    1710.      -41.    21854      369
          920211 050142.24   10324.      -118.    1711.      -44.    21854      369
          920211 050213.09   10324.      -118.    1713.      -46.    21854      369
          920211 050242.85   10324.      -118.    1711.      -47.    21854      369
          920211 050313.59   10324.      -117.    1711.       -49    21854      369
          920211 050350.93   10325.      -117.    1711.      -50.    21854      369

16987     82.52     67.49   -.0001  86 074   8   202.65    920211
          920211 175917.69     346.        -8.     -34.      -16.    89416      242
          920211 175951.58     345.       -13.    -170.       -7.    89416      242

17000    102.49    128.41   -.0013  76 077  EX   296.24    920211
          920211 172952.42    3450.       189.     636.        2.    90000      241
          920211 173019.24    1409.       155.     536.       13.    90000      241

17116     99.12    100.44   -.0038  86 019   L   184.21    920211
          920211 080611.17     418.        15.      68.       -5.    94707      399

17123     98.34    100.07   -.0035  86 019   T    68.53    920211
          920115 235247.13     422.       -70.    -758.        9.    88904      398

17128     98.86    102.40   -.0025  86 019   X    90.94    920211
          920211 064928.93     490.        -7.     -98.       -9.    89871      231
          920211 064956.54     503.         3.    -213.      -17.    89871      231

17130     98.55    100.50   -.0024  86 019   2   106.66    920211
          920211 003102.63     453.        11.    -367.        8.    90000      329
          920211 031640.59     448.      -308.    1551.       16.    94687      399

17141     74.01    115.07   -.0000  86 092   D    72.07    920212
          920211 191017.87     788.      -232.   -1414.        9.    95222      393

17164     89.34    108.23   -.0001  85 066   G   276.67    920211
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 SAT        INC    PERIOD      DRAG  INTL DESIG     R.A.      EPOCH
           DATE       TIME      ALT          ΔU       ΔV         ΔW        TAG    SENSOR


         920123 042305.72      552.        -98.      755.        -2.    88893       398

17181       .58  1436.41   0.0000  86 096   A   303.15     920231
         920211 090453.32    19327.      -1031.    -9925.       12.    20946       334

17189    98.03     99.97   -.0203  86 019  AT   271.24     920211
         920211 194610.19      423.          5.     -125.      -18.    86622       329

17216    64.06    705.83   -.0006  86 098   D    79.51     920211
         920211 123304.12     7057.       -119.     -970.       30.    93970       399

17239    82.93    105.02   -.0000  86 100   A    63.43     920212
         920211 052307.17      526.         -6.        4.      -16.    89812       232

17253     8.23    540.80   -.0411  86 026   E   121.31     920124
         920114 103256.76     5280.        135.      139.        -3.    17253       334
         920114 103453.90     5510.        132.      141.       -10.    17253       334
         920114 103504.50     5531.        133.      144.        -9.    17253       334
         920114 103515.14     5553.        134.      142.        -2.    17253       334
         920114 103536.53     5595.        133.      145.        -3.    17253       334
         920114 105051.82     7276.        117.      120.        -6.    17253       334
         920114 105316.72     7526.        116.      125.         6.    17253       334
         920114 105529.58     7752.        117.      108.        26.    17253       334
         920114 105619.19     7835.        116.      111.        32.    17253       334

17307    97.76     95.89   -.1105  86 019  CP   221.22     920211
         920211 081411.31      314.          2.        1.         2.    90000       329

17333    63.32    730.79    .0010  87 008   D    93.28     920210
         920211 093927.84     5700.       -534.    -2024.       44.    89832       232
         920211 093948.48     5736.       -548.    -2079.       36.    89832       232
         920211 094011.52     5776.       -565.    -2140.       28.    89832       232
         920211 094223.80     6011.       -662.    -2487.      -26.    89832       233
         920211 094258.77     6073.       -688.    -2578.      -41.    89832       233

17359    82.93    104.63   -.0001  87 009   A   327.55     920211
         920211 194036.11      547.       -125.     1004.      -10.    87272       396

17481    31.08     94.62   -.0058  87 012   B   216.58     920211
         920204 215632.71      299.         -6.     -472.      -10.    19994       399

17628    82.76    100.57   -.0048  81 053  LA   287.88     920211
         920211 003102.63      453.       -131.     1109.      -12.    90000       329

17665    78.67    110.95   -.0042  63 053   K   301.54     920211
         920211 041232.53      695.       -112.     1061.      -16.    93903       396
         920211 041242.40      695.        -97.      989.       -2.    93903       396
         920211 041252.25      694.        -83.      916.       11.    93903       396

17670    65.74    105.09   -.0113  76 126  BV   199.83     920211
         920210 205651.27      306.       -274.     1260.      -14.    19994       399
         920210 205741.45      288.       -284.     1266.        8.    19994       399

17698    98.53     91.57   -.3479  86 019  LW   164.03     920207
         920207 072820.65      166.       -276.     1335.      -11.    15390       398

17719    99.42    104.96   -.0021  70 025  PH    78.68     920231
         920211 051401.39      537.          8.     -669.       -6.    89810       232

17754    74.04    100.76   -.0009  85 079   C   190.28     920211
         920211 182853.30      406.        -70.     -661.      -15.    95201       393

17872    11.80   1436.78   0.0000  75 092   F    44.00     920208
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  SAT        INC   PERIOD      DRAG  INTL DESIG     R.A.    EPOCH
            DATE      TIME      ALT         ΔU        ΔV       ΔW        TAG    SENSOR


          920210 224446.40    19409.      -340.     4480.     -12.     89413       242
          920210 224519.31    19409.      -340.     4479.      -8.     89413       242
          920210 224554.37    19409.      -340.     4479.      -4.     89413       242
          920210 224624.95    19409.      -340.     4478.      -0.     89413       242

18241     65.01   103.69     .0000  87 052   D    110.31   920211
          920211 065558.62      523.      -106.     1028.     -17.     13464       396
          920211 065608.49      523.      -103.     1018.       9.     13464       396

18257     74.05   100.24   -.0014  87 006   C    147.31   920211
          920211 175645.72      404.       -43.     -521.      17.     93974       396

18270     90.28   111.38   -.0006  65 027   Z    102.70   920211
          920211 040952.82      705.        -1.     -103.       7.     93902       396
          920211 041002.69      705.        -1.     -103.       7.     93902       396
          920211 041012.56      705.        -2.     -102.       7.     93902       396
          920211 041032.30      704.        -2.     -102.       7.     93902       396

18272     64.01   114.82   -.0005  76 067  8L    289.34   920211
          920211 184303.83      561.      -299.     1757.      -4.     93983       396

18277     81.19    94.44   -.0061  71 003   C    115.58   920211
          920211 125447.90      237.      -366.     1568.     -13.     94139       393
          920211 125625.30      238.      -103.      810.     -18.     94139       393

18279     65.83   105.34   -.0014  82 055  B8    102.75   920211
          920210 211939.45      535.      -342.    -1652.     -17.     89298       221

18415     65.83   105.78    .0001  82 055  8E    213.57   920211
          920211 122444.75      600.        72.     -143.      10.     93957       396
          920211 122454.62      606.        72.     -139.     -16.     93957       396

18418    100.13   106.17   -.0014  70 025  PL    120.20   920211
          920208 050528.32      567.       -21.      392.      -3.     15390       398

18467     98.71   101.71   -.0003  78 026  HE     26.66   920210
          920211 191058.55      482.        40.     -158.     -18.     95223       393

18471     65.77   118.66   -.0007  76 067  BN    161.12   920211
          920211 000514.37      624.      -359.    -1865.       3.     86734       329

18511    302.64   112.32   -.0106  73 086  GV    354.13   920211
          920211 190907.62      871.       328.     -671.     -18.     95219       393

18512     74.04    99.81   -.0014  77 119   E    115.51   920211
          920211 154408.01      418.      -151.     1104.      19.     19261       399

18518     65.77   113.41   -.0001  76 126  BW    210.84   920211
          920211 040254.32      679.      -185.     1841.     -13.     86778       329

18527     70.99   104.89   -.0001  87 027   E     84.44   920211
          920211 011415.85      464.      -348.     1435.      -3.     94679       399

18538     90.30   111.35   -.0001  65 027  AF    102.63   920205
          920211 035934.63      707.      -206.     1289.     -20.     19185       396
          920211 035944.50      706.      -206.     1289.     -20.     19185       396
          920211 035954.40      706.      -206.     1289.     -20.     19185       396
          920211 040952.82      705.      -124.    -1009.      10.     93902       396
          920211 041002.69      705.      -124.    -1009.       9.     93902       396
          920211 041012.56      705.      -124.    -1008.       9.     93902       396
          920211 041032.30      704.      -124.    -1008.       9.     93902       396

18549     62.22   113.36   -.0020  68 091  0E     38.36   920211
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  SAT        INC    PERIOD      DRAG  INTL DESIG     R.A.     EPOCH
            DATE        TIME     ALT          ΔU      ΔV        ΔW        TAG   SENSOR


           920210 211939.45      913.       -19.      -7.      -17.     89298      221

18565       82.39    111.58   -.0014  81 053  LY   237.00    920211
           920211 113026.17      720.        79.    -233.       11.     90223      382

18571        7.05    546.33   -.0989  87 078   L   176.95    920211
           920210 232056.94    10517.      -223.    2852.        6.     89413      242
           920210 232721.32    10484.      -220.    2835.       -2.     89413      242
           920210 232742.25    10456.      -218.    2820.       -8.     89413      242
           920210 232803.48    10427.      -215.    2805.      -14.     89413      242

18589       58.46    149.73    .0028  64 006   N   308.52    920211
           920211 073121.06     1997.        31.    1210.       25.     89810      232
           920211 073142.81     1969.        30.    1131.       19.     89610      232
           920211 073221.36     1921.        27.     994.        8.     89810      232

18591      101.58    136.75   -.0006  76 077  FD   223.69    920211
           920211 100951.00      685.      -386.     455.       -7.     94714      399
           920211 223833.29     1778.      -101.    2762.       -0.     94749      399

18601       82.83    104.55   -.0006  81 053  MB   130.39    920206
           920211 051519.34      516.        45.     133.        3.     18601      399
           920211 051523.71      516.        45.     132.        3.     18601      399
           920211 051538.43      537.        45.     131.        3.     18601      399
           920211 051554.33      517.        44.     129.        3.     18601      399
           920211 051609.32      517.        44.     128.        3.     18601      399

18606       65.85    116.27   -.0003  76 067  BP   353.40    920211
           920128 233002.62      808.      -293.   -1698.        4.     88892      398

18644       66.98    101.75   -.0035  80 030  AY   104.51    920211
           920211 191058.55      482.      -253.    1495.       -3.     95223      393

18645      102.14    116.64   -.0000  73 086  GW   330.14    920203
           920211 074226.79      887.        23.    -147.        5.     93925      396

18689       65.84    124.69   -.0000  76 067  3R    79.57    920201
           920210 223458.82      908.      -124.     795.       -1.     90220      395

18693      101.63    116.53   -.0011  74 089  FA   120.99    920211
           920211 171026.39      874.       147.      55.       12.     94742      399

18779       98.96    103.76   -.0017  78 026  HJ   282.01    920211
           920211 083330.45      446.      -206.    -889.      -12.     89338      232

18864       29.04    104.56   -.0041  77 065  FV   298.99    920211
           920211 031423.87      794.       144.   -1023.      -13.     94567      399

18946       83.28    717.88    .0015  88 017   A   121.58    920211
           920211 180017.19     3841.     -1428.    6593.      -41.     89416      242

18955       98.50     98.12   -.0115  88 006   D   319.01    920211
           920211 053140.08      362.         1.       9.       10.     18955      399
           920211 065624.74      357.        -2.       7.       14.     18955      396
           920211 065634.61      357.        -2.       7.       14.     18955      396
           920211 065644.48      357.        -2.       8.       14.     18955      396

18965       90.30    111.41   -.0002  65 027  AN   103.38    920211
           920211 035934.63      707.       -96.     886.        6.     19185      396
           920211 035944.50      706.       -96.     879.        6.     19185      396
           920211 035954.40      706.       -96.     879.        5.     19185      396
           920211 073327.14      682.      -222.    1258.        7.     89376      232
  SAT       INC   PERIOD      DRAG  INTL DESIG    R.A.     EPOCH
           DATE      TIME      ALT         ΔU      ΔV        ΔW        TAG    SENSOR


 18985    82.95   104.67   -.0000  88 023   A    88.37    920212
          920124 052920.50    515.       -2.    -106.       -6.     12102      385

 18997    65.73   105.91   -.0042  77 121  BR   301.69    920211
          920211 175641.24    446.       48.    -417.       -8.     89416      242
          920211 175709.66    509.      100.    -557.        5.     89416      242
          920211 175726.50    559.      138.    -655.       14.     90004      241

 19006    73.50   113.80   -.0022  87 020  BB   245.70    920212
          920211 142551.88    728.      -65.    -497.       18.     94720      399

 19051    87.23   166.17   0.0000  63 014  EA   289.07    920210
          920211 091904.06   1489.      -20.      73.      -22.     89832      232

 19105    98.75    99.62   -.0006  75 004  HN   300.12    920211
          920211 174459.73    449.       30.      87.        4.     89417      242
          920211 174508.59    435.       17.      53.       14.     89415      241
          920211 174525.20    416.       -1.      -9.       13.     89417      242

 19106    30.46   104.34   -.0019  63 047   T   163.86    920211
          920205 130741.94    649.     -267.   -1587.      -16.     88079      398

 19111    82.01   113.85   -.0002  85 094   V   340.24    920205
          920211 195216.51    756.       -1.      16.       -0.     19111      396
          920211 195226.35    756.       -1.      16.       -0.     19111      396
          920211 195236.22    756.       -1.      16.        0.     19111      396

 19113    90.30   111.05   -.0000  65 027  AQ   103.77    920211
          920211 041222.66    695.      -63.    -723.       -4.     93903      396
          920211 041232.53    695.      -63.    -724.       -4.     93903      396
          920211 041242.40    695.      -63.    -724.       -4.     93903      396
          920211 041252.25    694.      -63.    -723.       -4.     93903      396
          920211 041302.14    694.      -63.    -723.       -3.     93903      396

 19136    82.42   112.20   -.0005  78 100   J   143.45    920231
          920211 101116.87    671.      111.    -260.       18.     89813      232

 19150   100.36   107.05   -.0018  70 025  PS   211.81    920211
          920126 083727.69    630.       16.    -198.       11.      3899      745

 19163    64.95   675.73   -.0003  86 043   A   139.05    920211
          920211 041454.07  10317.      -13.     -75.       39.     21854      404
          920211 041535.20  10316.      -15.     -79.       44.     21854      404
          920211 041616.34  10315.      -15.     -96.       27.     21854      404
          920211 041657.47  10316.      -15.     -86.       35.     21854      404
          920211 041738.61  10315.      -15.     -83.       39.     21854      404
          920211 041819.74  10315.      -15.     -88.       37.     21854      404
          920211 041900.87  10315.      -15.     -92.       29.     21854      404
          920211 041942.01  10317.      -13.     -80.       25.     21854      404
          920211 042023.14  10315.      -15.     -85.       38.     21854      404
          920211 042104.28  10313.      -17.     -97.       34.     21854      404
          920211 042145.41  10315.      -15.     -93.       24.     21854      404
          920211 042226.55  10318.      -12.     -66.       32.     21854      404
          920211 042307.68  10315.      -15.     -86.       32.     21854      404
          920211 042348.81  10316.      -14.     -91.       20.     21854      404
          920211 042429.95  10315.      -14.     -87.       27.     21854      404
          920211 042511.08  10314.      -15.     -90.       30.     21854      404
          920211 042552.22  10315.      -14.     -94.       18.     21854      404
          920211 042633.35  10312.      -18.    -108.       28.     21854      404

 19169    65.41   339.87   -.0001  88 043   G    64.70    920210
          920211 041616.34  10315.     -580.    5702.       -7.     21854      404
 SAT        INC   PERIOD     DRAG  INTL DESIG    R.A.    EPOCH
            DATE      TIME    ALT         ΔU       ΔV       ΔW      TAG   SENSOR


19170      65.34   339.93   -.0000  88 043   H    64.86   920209
          920211 041535.20   10316.    -235.    5976.     -30.    21854     404
          920211 041616.34   10315.    -249.    5952.      28.    21854     404

19185      90.29   111.36   -.0000  65 027  AR   102.75   920211
          920211 073057.02     699.     -40.     508.     -15.    89810     232
          920211 073121.06     680.     -49.     408.     -12.    89810     232
          920211 073142.81     669.     -52.     321.     -12.    89810     232
          920211 073221.36     666.     -46.     173.     -20.    89810     232

19235      74.02   104.01   -.0001  86 030   H   121.13   920231
          920211 174633.88     495.     -20.     151.      -9.    89415     241
          920211 174634.25     495.     -20.     147.      -2.    89417     242
          920211 174701.55     503.      -8.      46.     -16.    89415     241
          920211 174711.38     511.      -1.       7.     -11.    89417     242

19293      66.98   110.10   -.0003  61 OMI 239   130.90   920210
          920211 044449.29     802.      97.    -638.     -15.    94695     399

19318      65.81   103.91   -.0062  71 015  DR   325.10   920209
          920211 033025.09     712.     374.    -539.      12.    93901     396

19352      81.99   106.55   -.0984  78 100  AF   167.45   920210
          920211 023952.93     673.      20.      35.      11.    86712     329

19362      62.81   108.08   -.0029  68 091  OJ   276.95   920212
          920211 035847.67     726.      64.    1719.      -5.    90201     382

19380      65.01   730.82   -.0088  88 069   O   272.16   920211
          920211 083818.91    4110.    -355.   -2691.     -14.    89832     232
          920211 083843.59    4077.    -354.   -2735.      12.    89832     232
          920211 083904.72    4049.    -352.   -2774.      33.    89832     232

19396      58.49    98.17   -.0001  63 054   E    29.56   920211
          920210 093807.19     360.     -25.    -369.     -13.    15390     398

19437      72.58   105.93   -.0642  87 020  BZ   129.97   920209
          920211 225736.68     637.     -16.     349.       8.    90000     329
          920211 064921.49     626.      -1.     285.       0.    93919     396
          920211 064931.36     627.      -1.     284.       0.    93919     396
          920211 064955.04     628.      -1.     284.      -0.    93919     396
          920211 065004.91     628.      -1.     284.       0.    93919     396

19473      65.83   104.74   -.0006  82 055  BL    99.50   920211
          920208 050624.96     500.    -142.    -974.      -5.    15390     398

19479      62.82   107.18   -.0015  68 097  ET   308.08   911101
          920206 120547.77     544.     -48.     768.       1.    21538     398
          920211 131850.04     809.     222.   -1091.     -16.    90233     383
          920211 131900.09     827.     239.   -1108.      18.    90233     383

19482      66.35    99.52   -.0034  61 OMI 295   317.24   920211
          920211 185858.68     458.      18.      58.      -2.    89298     243
          920211 185926.40     431.      -9.     -43.       2.    89298     243
          920211 185956.86     426.     -17.    -160.      10.    89298     243

19484        .02  1436.12   0.0000  88 081   B   337.73   920203
          920211 085933.98   19413.      63.   -1008.     -17.    90000     951
          920211 085949.03   19413.      63.   -1008.     -17.    90000     951
          920211 090003.68   19413.      63.   -1008.     -17.    90000     951
          920211 090018.48   19413.      63.   -1008.     -17.    90000     951

19502      65.55   675.73    .0001  86 085   B    18.18   920210
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  SAT        INC   PERIOD      DRAG  INTL DESIG    R.A.     EPOCH
            DATE      TIME      ALT        ΔU        ΔV       ΔW        TAG    SENSOR


           920211 093241.74   10318.       -5.      -46.       1.     89336       232

 19541     64.79    717.53   -.0001  88 090   A   273.61   920211
           920211 084751.73    5496.     -169.    -1615.     -39.     89832       232
           920211 084813.75    5461.     -166.    -1649.     -13.     89832       232
           920211 084836.37    5424.     -164.    -1684.      12.     89832       232
           920211 084857.67    5389.     -161.    -1716.      36.     89832       232

 19560     62.33    116.62   -.0002  68 091  DL   108.82   920210
           920209 151846.06    1040.     -210.     2067.      -7.     88079       398

 19574     82.53     97.47   -.0002  88 093   B   122.23   920211
           920211 094223.80     337.      -37.     -235.      18.     89832       233

 19576     90.29    111.14   -.0002  65 027  AV   104.40   920209
           920113 055312.35     705.     -380.    -3748.      11.     12102       399
           920113 055336.03     705.     -361.    -1748.      12.     12102       399
           920113 055423.11     706.     -380.    -1749.      11.     12102       399
           920113 055509.31     706.     -380.    -1749.      11.     12102       399
           920113 055555.20     706.     -380.    -1750.      11.     12102       399

 19590    102.38    116.61   -.0000  73 086  HF    22.98   920211
           920211 131850.04     809.     -129.     -959.       0.     90233       383

 19608     63.26    717.07    .0057  88 096   A   107.09   920211
           920211 031726.20    1128.    -1114.     -514.      15.     94567       399

 19611     63.53    704.92    .0004  88 096   O   104.35   920211
           920211 125727.81   10302.      629.     1051.      -1.     83410       369
           920211 125727.81   10302.      629.     1051.      -1.     83421       369

 19656     70.99    105.18   -.0002  88 102   C   205.03   920211
           920211 101933.53     631.      -35.      821.       5.     94491       399

 19659     71.04    104.76   -.0003  88 102   F   190.15   920211
           920206 095138.79     540.     -170.     -905.     -13.     15390       398

 19690      7.02    392.71   -.1236  88 109   D   288.33   920211
           920114 201939.79    1000.      194.      946.      19.     21692       398
           920114 202005.10     957.      198.      906.     -43.     21692       398

 19771     46.64    331.47   -.1791  89 004   E   117.84   920211
           920206 150119.14    1055.     -752.    -3115.      43.     88079       398

 19822     75.09    193.00   -.0197  89 016   A   292.55   920211
           920211 074001.84     497.      154.      169.      -3.     89324       232

 19853     82.97    106.41   -.0004  81 053  MN   285.02   920210
           920211 073534.40     506.      -60.      -77.       6.     89812       232

 19877      6.63    212.78  -1.3103  89 020   C   259.61   920211
           920206 143035.10    2210.      426.    -1926.      31.     15390       398
           920210 230244.97     384.      276.      422.       6.     89413       242
           920210 230314.40     257.      168.      257.     -25.     89413       242

 19948     99.56    113.31   -.0001  70 025  QD   234.84   920211
           920211 223435.15     788.     -238.     -947.     -10.     94750       399

 19950     90.31    111.43    .0000  65 027  AY   103.04   920204
           920213 152431.18     699.     -240.     1390.       1.     81560       399
           920211 152506.47     699.     -240.     1390.       2.     81580       399

 19952     75.61    155.90   -.0881  89 016   K   236.61   920210
 SAT        INC   PERIOD      DRAG  INTL DESIG    R.A.     EPOCH
           DATE      TIME      ALT         ΔU       ΔV       ΔW       TAG   SENSOR


         920208 120622.29     491.     -166.     1685.     -16.     21538      398

19960     62.90    110.96   -.0008  70 091  AY   191.73   920211
         920210 211850.51     512.     -203.    -1799.      -5.     89298      221

19993     60.80    127.15   -.0144  64 006   W   340.48   920212
         920211 035432.62     522.      260.      297.      -7.     86607      329
         920211 041232.53     695.       57.    -1240.     -14.     93903      396
         920211 041242.40     695.       32.    -1299.      20.     93903      396

19994     60.71    119.40   -.0092  64 006   X   234.20   920128
         920201 222215.38     303.      -36.      296.       3.     19994      399
         920201 222241.41     294.      -35.      296.       3.     19994      399
         920201 222317.01     282.      -34.      297.       3.     19994      399
         920203 220516.73     303.     -117.      654.       3.     19994      399
         920203 220519.69     302.     -116.      654.       3.     19994      399
         920203 220536.86     296.     -115.      655.       3.     19994      399
         920204 215559.39     311.     -195.      891.       2.     19994      399
         920204 215621.84     302.     -193.      894.       2.     19994      399
         920204 215632.71     299.     -192.      895.       3.     19994      399
         920205 214636.98     315.     -304.     1157.       2.     19994      399
         920205 214705.85     304.     -332.     1161.       2.     19994      399
         920205 214736.91     293.     -300.     1165.       2.     19994      399

19995     60.86    118.59   -.0216  64 006   Y   110.74   920112
         920205 121100.27    1061.       91.     1755.      17.     15390      398
         920211 074236.71     884.      -33.     -550.       1.     93925      396

20055     64.82    733.31   -.0093  89 043   O   316.52   920210
         920211 123849.23    3662.       18.      694.     -24.     88629      334
         920211 053635.68   21096.    -1004.     7630.       6.     89812      232

20082     65.00    339.46   -.0002  89 039   H    51.15   920212
         920211 083330.45    3542.       -2.      817.     -40.     89336      232
         920211 083352.26    3574.       -3.      760.     -33.     89336      232

20123      6.49    382.62   -.1306  69 053   B   291.94   920211
         920211 165652.54    2785.      373.    -2370.     -44.      8547      334
         920211 165709.41    2753.      296.    -2391.      -5.      8547      334
         920211 225715.81    1328.      312.    -2780.      22.     94752      399
         920211 225812.65    1443.      296.    -2993.      40.     94752      399
         920211 225828.21    1474.      286.    -3053.      44.     94752      399

20127      7.99    631.45   -.0053  88 063   E   333.55   920209
         920211 172857.63    4943.     -790.    -5457.       4.     90000      241
         920211 172923.67    5019.     -836.    -5560.      16.     90000      241
         920211 172952.42    5103.     -888.    -5673.      29.     90000      241
         920211 173019.24    5180.     -937.    -5778.      42.     90000      241

20129     82.52    115.29   -.0024  78 100  AR   202.87   920211
         920131 234032.22     930.       -5.     -904.      13.     88032      398
         920210 211856.51     700.      278.      340.      17.     89298      221

20131     90.32    111.18    .0003  65 027  BD   101.64   911203
         920116 052633.12     700.     -369.     1728.     -10.      3899      396

20171      7.22    115.26   -.6425  89 062   D   325.13   920211
         920211 090347.41    1017.       -9.        1.      -7.     90436      385
         920211 090357.40    1027.       -4.        0.      -3.     90436      385
         920211 090427.59    1046.       -2.        2.      -1.     90436      385
         920211 090437.63    1055.        1.        0.       1.     90436      385
         920211 090447.68    1060.        0.       -0.       0.     90436      385
         920211 090457.72    1066.        1.       -0.       1.     90436      385
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SAT	INC	PERIOD	DRAG	INTL DESIG	R.A.	EPOCH		
	DATE	TIME	ALT	ΔU	ΔV	ΔW	TAG	SENSOR
	920211	090507.77	1072.	1.	-1.	1.	90436	385
	920211	090517.82	1078.	2.	-0.	2.	90436	385
	920211	090527.65	1034.	2.	-0.	2.	90436	385
	920211	090537.90	1089.	2.	0.	2.	90436	385
	920211	090645.29	1124.	1.	-3.	1.	90437	385
	920211	090655.34	1131.	6.	-2.	3.	90437	385
	920211	090705.38	1135.	1.	-1.	1.	90437	385
	920211	090725.47	1145.	1.	-0.	1.	90437	385
	920211	090735.51	1149.	0.	1.	1.	90437	385
	920211	090755.60	1160.	0.	2.	1.	90437	385
	920211	090805.65	1165.	0.	2.	1.	90437	385
	920211	090946.74	1204.	-10.	1.	-9.	90438	385
20258	63.70	698.33	-.0008	89 078 0	44.70	920210		
	920211	082926.77	3971.	-1320.	6123.	-22.	89336	232
	920211	083016.70	3991.	-1220.	5998.	-34.	89336	232
	920211	083054.25	4008.	-1151.	5906.	-41.	89336	232
	920211	083121.75	4023.	-1104.	5839.	-46.	89336	232
	920211	084459.95	4906.	-326.	4093.	-44.	89336	232
	920211	084538.84	4963.	-305.	4018.	-41.	89336	232
	920211	084608.24	5007.	-290.	3961.	-39.	89336	232
	920211	084639.85	5055.	-274.	3900.	-37.	89336	232
	920211	085524.11	5909.	-64.	2891.	-14.	89336	232
	920211	085601.02	5972.	-53.	2890.	-14.	89336	232
	920211	085640.36	6039.	-41.	2743.	-14.	89336	232
	920211	085711.05	6092.	-33.	2683.	-15.	89336	232
	920211	085815.60	6204.	-15.	2557.	-13.	89336	232
	620211	085851.19	6265.	-6.	2487.	-20.	89336	232
	920211	085934.81	6341.	4.	2402.	-22.	89336	232
	920211	090006.51	6396.	12.	2339.	-24.	89336	232
20261	82.59	115.55	-.0002	89 080 A	203.88	920212		
	920210	234322.80	1029.	-4.	-5.	-8.	90406	385
	920210	234342.89	1037.	-4.	-5.	-9.	90406	385
	920210	234352.93	1044.	-1.	-4.	-5.	90406	385
	920210	234402.98	1049.	-0.	-4.	-4.	90406	385
	920211	182730.53	406.	98.	455.	11.	95201	393
20262	82.59	115.72	-.0002	89 080 C	204.65	920211		
	920128	233141.60	664.	-420.	-1321.	-8.	88892	398
	920211	205718.99	456.	-163.	1081.	-3.	94000	396
	920211	205728.86	456.	-168.	1074.	19.	94000	396
20281	82.59	115.48	-.0001	89 080 B	203.38	920212		
	920210	202258.95	755.	397.	653.	-14.	89207	221
20282	65.65	114.72	-.0002	76 067 BV	242.52	920211		
	920211	144236.15	1017.	-124.	844.	-14.	90236	383
20303	35.65	98.75	-.0009	89 085 B	280.17	920212		
	920211	030700.21	273.	-222.	284.	-9.	90643	383
	920211	030706.66	277.	-213.	294.	-1.	90643	383
	920211	030707.99	278.	-218.	296.	0.	90643	383
20307	82.07	109.21	-.0097	78 100 AS	169.50	920211		
	920213	071938.63	1055.	-118.	1504.	-15.	93922	396
20308	82.67	114.81	-.0024	78 100 AT	209.71	920211		
	920211	132010.39	963.	363.	-1622.	-4.	90233	383
	920211	191058.55	482.	165.	-114.	-15.	95223	393
20330	62.79	717.52	.0111	89 091 A	207.06	920211		
	920211	090946.74	1204.	153.	-610.	-19.	90438	385

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 SAT        INC   PERIOD      DRAG  INTL DESIG     R.A.     EPOCH
            DATE      TIME      ALT         ΔU       ΔV        ΔW        TAG    SENSOR


20333     63.24   705.20    -.0006  89 091   0    205.78    920211
          920210 232803.48    2875.      447.    -2676.       49.     89413       242
          920211 110649.27     338.    -1031.     1174.      -19.     94716       399

20399     46.89   483.66    -.0184  89 101   E      3.41    920210
          920211 060043.22   13942.     -624.     3166.       32.     89376       232
          920211 060107.15   13933.     -019.     3144.       48.     89376       232

20406     26.71   331.33    -.0202  90 001   F     15.68    920212
          920210 224624.95    3626.     -480.    -5303.      -38.     89413       242

20465     82.50    97.48    -.0005  90 010   A    358.03    920211
          920211 080517.12     357.     -373.    -1647.       -7.     94707       399

20488      7.44   314.55    -.0496  88 063   F    276.88    920208
          920129 235511.74     970.      673.     -588.      -23.     88788       398
          920129 235554.87     894.      615.     -644.       10.     88788       398

20510     82.52    97.51    -.0005  90 018   A    259.32    920212
          920211 011134.04     336.     -278.    -1397.       -9.     94679       399

20557     73.96   117.78     .0000  90 029   J    133.83    920211
          920211 094223.80     801.       10.       32.        4.     89832       233

20559     30.74   597.18    -.0479  90 030   B    139.12    920210
          920210 200459.89   17076.     -930.    -3871.       -5.     82080       222
          920210 200554.17   17059.     -923.    -3845.      -47.     82080       222
          920210 205543.87   17037.     -928.     8640.      -30.     89207       221

20572     18.62   414.60    -.1992  90 034   C     31.10    920211
          920211 125034.71    9662.      565.    -5113.      -33.     83410       369
          920211 125034.71    9662.      565.    -5113.      -33.     83421       369
          920211 125102.11    9706.      638.    -5143.      -15.     83410       369
          920211 125102.11    9706.      638.    -5143.      -15.     83421       369
          920211 125135.21    9758.      723.    -5182.        3.     83410       369
          920211 125135.21    9758.      723.    -5182.        3.     83421       369
          920211 125204.88    9804.      799.    -5218.       18.     83410       369
          920211 125204.88    9804.      799.    -5218.       18.     83421       369
          920211 125242.03    9863.      895.    -5260.       40.     83410       369
          920211 125242.03    9863.      695.    -5260.       40.     83421       369
          920211 000143.45    2177.       40.     2534.      -10.     88856       399

20578     82.94   104.71    -.0001  90 036   8     26.40    920212
          920206 095138.79     540.        1.     -283.       11.     15390       398

20581     73.99    89.76    -.0859  90 038   A     70.37    920212
          920211 105114.03     127.     -194.     1113.        9.     94117       393
          920211 183338.67     121.      -72.      606.        1.     82081       393
          920211 183414.27     124.      -46.      457.        0.     82061       393
          920211 183429.73     121.      -72.      608.        1.     82083       393
          920211 183437.73     127.      -31.      347.       -0.     82062       393
          920211 183437.80     127.      -33.      365.       -1.     82060       393
          920211 183449.70     128.      -25.      294.       -1.     82063       393
          920211 183505.27     125.      -46.      458.        0.     82061       393
          920211 183519.73     121.      -73.      610.        0.     82081       393
          920211 183528.97     127.      -33.      366.       -2.     82060       393
          920211 183529.03     127.      -31.      348.       -1.     82062       393
          920211 183540.87     129.      -25.      296.       -1.     82063       393
          920211 183555.27     125.      -45.      460.       -0.     82061       393
          920211 183609.77     121.      -73.      612.        0.     82081       393
          920211 183618.97     127.      -33.      367.       -1.     82060       393
          920211 183619.63     127.      -31.      349.       -0.     82062       393
          920211 183630.87     128.      -25.      297.       -1.     82063       393
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SAT        INC   PERIOD      DRAG  INTL DESIG    R.A.     EPOCH
          DATE     TIME       ALT        ΔU        ΔV        ΔW       TAG   SENSOR


         920211 183645.27     125.      -46.      461.       -0.    82061      393
         920211 183659.87     121.      -73.      614.        0.    82081      393
         920211 183708.97     128.      -33.      369.       -1.    82060      393
         920211 183709.03     128.      731.      350.       -0.    82062      393
         920211 183720.87     129.      -25.      298.       -1.    82063      393
         920211 183735.50     125.      -47.      463.       -0.    82061      393
         920211 183759.13     128.      -33.      370.       -1.    82060      393
         920211 183759.23     128.      -31.      352.        0.    82062      393
         920211 183811.07     129.      -25.      299.       -1.    82063      393
         920211 153245.25     133.      -20.      286.       -2.    90020      329
         920211 170043.38     134.      -16.      245.       -5.    90000      329

20586    63.11    733.11    .0028  90 039   D     98.15   920209
         920211 075840.02    5100.     -154.    -2240.       23.    89871      231
         920211 075859.00    5218.     -161.    -2296.       12.    89871      231
         920211 075921.67    5270.     -170.    -2356.       -1.    89871      231

20596    62.92    717.88    .0070  90 040   A    245.90   920211
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         920211 113648.71    1001.      -21.      -61.        1.    90447      385
         920211 113658.87    1017.      -20.      -61.        2.    90447      385
         920211 113708.90    1033.      -20.      -62.        3.    90447      385
         920211 113718.95    1048.      -20.      -62.        3.    90447      385
         920211 113728.99    1062.      -21.      -63.        1.    90447      385
         920211 113739.04    1078.      -22.      -61.        1.    90447      385
         920211 113749.08    1094.      -22.      -61.        1.    90447      385
         920211 113809.17    3126.      -22.      -60.        2.    90447      385
         920211 113819.22    1142.      -23.      -60.        2.    90447      385
         920211 113849.79    1195.      -20.      -64.        6.    90225      382
         920211 113859.83    1211.      -22.      -63.        4.    90225      382
         920211 113900.48    1212.      -22.      -65.        5.    90226      382
         920211 113909.87    1229.      -20.      -63.        6.    90225      382
         920211 113920.57    1248.      -23.      -62.        6.    90226      382
         920211 113930.07    1262.      -23.      -60.        4.    90225      382
         920211 113930.61    1264.      -22.      -62.        5.    90226      382
         920211 113940.11    1280.      -22.      -61.        5.    90225      382
         920211 113940.65    1281.      -21.      -61.        6.    90226      382
         920211 113950.25    1296.      -23.      -50.        4.    90225      382
         920211 113950.69    1299.      -21.      -61.        6.    90226      382
         920211 114000.31    1313.      -24.      -50.        3.    90225      382
         920211 114020.50    1349.      -25.      -59.        3.    90225      382
         920211 114020.83    1353.      -21.      -60.        7.    90226      382

20624    71.03    101.93  -.0001  90 046   A    127.66   920211
         920211 153935.33     458.     -311.     1526.       -4.    86767      329

20646    62.93    717.76    .0064  90 052   A    141.27   920211
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20662      .08   1432.69  0.0000  90 054   O    290.52   920210
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         920211 085949.03   19228.      -49.      533.       16.    90000      951
         920211 090003.68   19228.      -49.      532.       16.    90000      951
         920211 090018.48   19228.      -49.      532.       16.    90000      951

20669    24.51    669.91  -.0178  90 056   C     52.92   920211
         920211 031608.99     440.     -623.     -620.       28.    94687      399
         920211 031640.59     448.     -672.     -592.       39.    94687      399
         920211 031659.72     454.     -702.     -574.       45.    94687      399

20672    26.72    535.37  -.0014  67 001  AT    101.33   920107
         920201 114236.23     787.       65.     -158.        5.    20672      398
         920201 114357.08     674.       61.     -165.        3.    20672      398
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SAT        INC   PERIOD      DRAG  INTL DESIG     R.A.     EPOCH
           DATE        TIME   ALT          ΔU       ΔV       ΔW        TAG    SENSOR


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         920204 111014.06     200.      -527.   -1542.       -6.     88079       398
         920204 111031.90     207.      -513.   -1554.       43.     88079       398
         920211 120805.44    5534.     -1007.   -6097.      -37.     83999       222
         920211 120844.16    5493.     -1025.   -6142.      -34.     83999       222
         920211 121000.75    5413.     -1062.   -6232.      -30.     83999       222
         920211 121038.61    5376.     -1082.   -6279.      -28.     83999       222
         920211 121159.66    5299.     -1128.   -6383.      -24.     83999       222

20674      7.16    600.41  0.0000  84 081   E   324.79    920208
         920211 172039.88   18710.      -805.    9999.       -1.     83410       369
         920211 172039.88   18710.      -605.    9999.       -1.     83421       369
         920211 072931.29    1249.      -422.    2580.      -11.     90233       388
         920211 072941.34    1270.      -384.    2582.      -25.     90233       388
         920211 072951.39    1288.      -346.    2580.      -42.     90233       388

20704     46.97    490.31   .0280  90 054   E    69.41    920211
         920211 090056.60   13635.     -1040.   -4360.       -3.     89832       232
         920211 090126.29   13622.     -1038.   -4358.      -39.     89832       232

20717      3.72    635.39  -.0126  90 063   C   239.27    920209
         920211 025439.64    1096.       -23.    -645.      -44.     90198       383
         920211 025459.73    1129.        49.    -648.      -29.     90198       383
         920211 025509.77    1146.        84.    -553.      -22.     90198       383
         920211 025529.86    1180.       155.    -663.       -6.     90198       383
         920211 025539.90    1197.       390.    -667.        1.     90198       393

20742     62.95    717.80  -.0007  90 071   A   139.30    920211
         920211 174937.89   10342.        88.   -2438.      -22.     21854       399
         920211 175314.87   10342.       453.   -2338.      -45.     21854       399

20775     82.96    107.94  -.0044  90 078   B   231.24    920212
         920211 183000.53     406.      -299.     255.       12.     95201       393

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         920210 224446.40   18697.       -69.   -1809.      -31.     89413       242
         920210 224519.31   18898.       -69.   -1812.      -29.     89413       242
         920210 224554.37   18899.       -69.   -1814.      -26.     89413       242
         920210 224624.95   18899.       -70.   -1817.      -23.     89413       242
         920210 225947.88   18916.       -77.   -1877.       44.     89413       242
         920210 230020.69   18917.       -77.   -1880.       46.     89413       242

20805     82.93    104.72  -.0000  90 083   B    88.38    920212
         920124 052920.50     515.       -17.    -294.       -3.     12102       385

20827     82.53    104.08  -.0000  90 086   B   107.28    920211
         920211 031835.67     493.      -376.   -1635.       -4.     94687       399

20833     79.69     91.24 -2.2401  65 098   K   325.74    920210
         920211 201906.84     201.      -278.    1593.        7.     90249       383

20946       .02   1436.12  0.0000  90 100   B   295.29    920211
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         920211 085949.03   19327.         3.     -44.       -6.     90000       951
         920211 090003.68   19327.         3.     -44.       -6.     90000       951
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         920211 080606.75    1173.        -1.      -1.        1.     94236       399
         920211 080706.10    1057.        -0.      -0.        1.     94236       399
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         920211 080906.00     834.        -1.       1.        1.     94236       399
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  SAT       INC   PERIOD      DRAG  INTL DESIG    R.A.      EPOCH
            DATE     TIME      ALT         ΔU       ΔV        ΔW       TAG   SENSOR



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20962     11.77  1412.68    0.0000  75 100   F    42.71    920211
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          920210 224954.97   19253.    -1961.    10452.      -14.    89416      242
          920210 225040.46   19254.    -1960.    10449.       -8.    89416      242
          920210 225117.77   19255.    -1959.    10447.       -3.    89416      242
          920210 225302.73   19258.    -1956.    10440.       12.    89417      242
          920210 225336.57   19258.    -1956.    10439.       16.    89417      242
          920210 225410.08   19259.    -1955.    10436.       21.    89417      242
          920210 225448.37   19260.    -1954.    10433.       26.    89417      242

21011     64.87   675.24    0.0000  90 110   F   138.17    920209
          920211 022437.88   10305.     -526.    -3699.       46.    21854      369
          920211 022512.38   10305.     -526.    -3697.       45.    21854      369
          920211 022554.38   10305.     -526.    -3597.       45.    21854      369
          920211 022627.02   10305.     -526.    -3698.       46.    21854      369
          920211 022659.99   10305.     -526.    -3698.       47.    21854      369
          920211 022740.76   10305.     -526.    -3697.       45.    21854      369
          920211 022813.91   10305.     -526.    -3698.       44.    21854      369
          920211 022838.87   10305.     -526.    -3697.       44.    21854      369
          920211 022911.54   10305.     -526.    -3697.       45.    21854      369
          920211 022936.74   10305.     -526.    -3696.       45.    21854      369
          920211 023010.85   10305.     -526.    -3697.       45.    21854      369
          920211 023037.46   10305.     -526.    -3697.       45.    21854      369
          920211 023102.33   10305.     -526.    -3697.       44.    21854      369
          920211 023127.17   10305.     -526.    -3697.       44.    21854      369
          920211 023152.07   10305.     -526.    -3696.       44.    23854      369
          920211 023208.99   10305.     -525.    -3696.       45.    21854      369
          920211 023246.49   10305.     -526.    -3696.       44.    21854      369
          920211 023312.71   10305.     -525.    -3696.       43.    21854      369
          920211 023346.94   10305.     -525.    -3695.       44.    21854      369
          920211 023416.01   10305.     -525.    -3694.       43.    21854      369
          920211 030327.21   10306.     -522.    -3685.       32.    21854      369
          920211 030353.06   10306.     -522.    -3684.       33.    21854      369
          920211 030440.74   10306.     -522.    -3584.       33.    21854      369
          920211 030512.72   10306.     -522.    -3684.       33.    21854      369
          920211 030543.80   10306.     -522.    -3684.       32.    21854      369
          920211 030608.63   10306.     -522.    -3684.       32.    21854      369
          920211 030639.26   10306.     -521.    -3683.       32.    21854      369
          920211 030710.23   10306.     -521.    -3683.       33.    21854      369
          920211 030741.14   10306.     -521.    -3684.       32.    21854      369
          920211 030819.11   10306.     -521.    -3684.       32.    21854      369
          920211 030916.93   10306.     -521.    -3684.       31.    21854      369
          920211 031003.22   10306.     -521.    -3683.       31.    21854      369
          920211 031034.16   10306.     -521.    -3682.       30.    21854      369
          920211 031105.07   10306.     -521.    -3681.       30.    21854      369
          920211 031136.06   10306.     -520.    -3680.       30.    21854      369
          920211 035325.95   10311.     -512.    -3565.       10.    21854      369
          920211 035421.37   10311.     -512.    -3665.       11.    21854      369
          920211 035502.62   10312.     -512.    -3667.       12.    21854      369
          920211 035530.55   10312.     -512.    -3667.       13.    21854      369
          920211 035558.37   10312.     -511.    -3667.       13.    21854      369
          920211 035639.62   10312.     -511.    -3667.       13.    21854      369
          920211 035721.07   10312.     -511.    -3668.       12.    21854      369
          920211 035816.75   10312.     -511.    -3668.       11.    21854      369
          920211 035911.97   10312.     -511.    -3666.       10.    21854      369
          920211 040006.30   10312.     -511.    -3666.        9.    21854      369
          920211 040101.95   10312.     -511.    -3666.        9.    21854      369
          920211 040145.12   10313.     -510.    -3666.        9.    21854      369
          920211 040214.22   10313.     -510.    -3667.        8.    21854      369
          920211 040242.32   10313.     -510.    -3667.        7.    21854      369
          920211 040311.82   16313.     -510.    -3667.        7.    21854      369
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   SAT        INC    PERIOD      DRAG  INTL DESIG     R.A.      EPOCH
               DATE       TIME     ALT         ΔU       ΔV         ΔW        TAG    SENSOR


            920211 041331.80    10316.     -505.    -3659.        1.      21854       404
            920211 041412.94    10313.     -511.    -3669.       12.      21854       404
            920211 041454.07    10317.     -504.    -3658.       -8.      21854       404
            920211 041535.20    10316.     -506.    -3661.       -1.      21854       404
            920211 041616.34    10315.     -511.    -3678.      -17.      21854       404
            920211 041657.47    10316.     -508.    -3668.       -8.      21854       404
            920211 041738.61    10315.     -507.    -3665.       -2.      21854       404
            920211 041819.74    10315.     -509.    -3570.       -3.      21854       404
            920211 041900.87    10315.     -530.    -3674.       -9.      21854       404
            920211 041942.01    10317.     -505.    -3663.      -12.      21854       404
            920211 042023.14    10315.     -509.    -3667.        2.      21854       404
            920211 042104.28    10313.     -513.    -3678.       -0.      21854       404
            920211 042145.41    10315.     -510.    -3675.       -9.      21854       404
            920211 042226.55    10318.     -501.    -3650.        0.      21854       404
            920211 042307.68    10315.     -509.    -3668.        2.      21854       404
            920211 042348.81    10316.     -509.    -3673.       -9.      21854       404
            920211 042429.95    10315.     -509.    -3670.       -1.      21854       404
            920211 042511.08    10314.     -510.    -3672.        3.      21854       404
            920211 042552.22    10315.     -510.    -3676.       -7.      21854       404
            920211 042633.35    10312.     -518.    -3689.        4.      21854       404
            920211 050100.73    10324.     -497.    -3660.      -16.      21854       369
            920211 050142.24    10324.     -496.    -3659.      -18.      21854       369
            920211 050213.09    10324.     -496.    -3659.      -19.      21854       369
            920211 050242.85    10324.     -496.    -3659.      -19.      21854       369
            920211 050313.59    10324.     -496.    -3659.      -19.      21854       369
            920211 050350.93    10325.     -495.    -3659.      -19.      21854       369
            920211 050435.26    10324.     -496.    -3658.      -13.      21854       369
            920211 050515.15    10325.     -496.    -3658.      -19.      21854       369
            920211 050552.43    10325.     -495.    -3657.      -20.      21854       369
            920211 050629.74    10325.     -495.    -3658.      -22.      21854       369

 21013      65.08     340.15   -.0008  90 110    H    354.77    920211
            920211 031136.06    10306.     -475.    -4734.      -16.      21854       369

 21049      25.27     635.79    .0020  91 001    C    167.08    920210
            920211 175348.96    18398.      739.     9999.       25.      83410       369
            920211 175348.96    18398.      739.     9999.       25.      83421       369

 21057       6.59     599.86   -.0628  91 003    C    105.50    920210
            920209 120409.88     1410.      526.    -2482.      -21.      15390       398

 21058       6.87     510.78   -.2442  91 003    D     89.73    920211
            920209 120544.80     1568.       78.    -3379.      -43.      15390       398
            920211 060621.80     3360.       -0.       10.       -1.      90839       399
            920211 060717.22     3239.        1.       -1.        1.      90839       399
            920211 060818.51     3104.        0.       -1.       -0.      90839       399
            920211 060916.96     2975.        0.        1.        1.      90839       399
            920211 061020.03     2835.       -0.        1.        0.      90839       399
            920211 061125.36     2690.       -0.        2.        1.      90839       399

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 21115      74.04     118.47   -.0000  91 009    M     97.73    920211
            920211 084013.83      799.      -83.     -375.        9.      89832       232
            920211 084036.55      805.      -86.     -472.        5.      89832       232
            920211 084103.66      814.      -85.     -564.        4.      89832       232
            920211 084126.91      828.      -83.     -656.        6.      89832       232

 21128      66.04     116.56   -.0004  76 067   BY     56.15    920212
            920211 053635.68      504.     -175.      355.       -9.      89812       232
            920211 053724.35      552.     -128.      216.      -15.      89812       232
            920211 053749.34      587.      -96.      152.      -18.      89812       232
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  SAT        INC    PERIOD       DRAG  INTL DESIG     R.A.     EPOCH
             DATE      TIME       ALT         ΔU       ΔV        ΔW        TAG    SENSOR


          920211 053816.92       632.        -56.       84.       -20.     89812       232

 21137     74.04    118.23    -.0000  91 009   P     94.57    920212
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          920114 201849.91      1086.        -37.     2778.       34.     21692       398
          920114 201914.79      1042.        -51.     2699.       -9.     21692       398
          920114 201939.79      1000.        -67.     2623.      -50.     21692       398

 21150     24.96     99.90    -.0030  91 018   B     52.97    920211
          920208 120547.77       544.       -328.     2129.      -15.     21538       398
          920211 075734.75       422.        113.      343.       -0.     89871       231
          920211 075840.02       291.          6.       72.       10.     89871       231
          920211 075859.00       282.          2.       -7.        9.     89871       231
          920211 075921.67       295.         17.      -92.        6.     89871       231
          920211 011328.18       418.         58.      359.        6.     94679       399

 21152     82.92    104.85    -.0000  91 019   A    241.26    920212
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 21164     74.04    117.85    0.0000  91 009  AB     91.92    920211
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          920211 065941.67       861.        -91.      853.      -13.     89810       232
          920211 070005.41       835.        -96.      752.       -7.     89810       232
          920211 070028.92       814.        -99.      655.       -2.     89810       232
          920211 070052.18       798.       -100.      562.        0.     89810       232

 21182     74.00    118.01    -.0000  91 009  AV     92.08    920211
          920211 121159.66       892.        -85.    -1084.        2.     83999       222

 21185     74.02    118.43     .0000  93 009  AY     96.07    920211
          920211 073846.40       833.        -32.       41.       10.     89324       232
          920211 073912.36       877.         15.      -19.       -6.     89324       232

 21196     62.93    717.68    0.0000  91 022   A    264.13    920211
          920114 105316.72      7526.         19.     3811.      -34.     17253       334
          920211 083534.22      7803.         25.      894.       31.     90000       232

 21211     74.10    118.21    -.0001  91 009  BE     96.11    920211
          920211 063534.22       788.        -90.     -385.       21.     90000       232

 21223      3.68    635.43    -.0143  91 026   B    239.50    920211
          920128 114546.87      1009.       -209.    -1323.      -40.     21223       383
          920211 144226.11      1037.         -3.      -13.       13.     90236       383
          920211 144236.15      1017.         -4.       -6.        8.     90236       383
          920211 144246.19       997.         -5.       -4.        5.     90236       383
          920211 144256.24       977.         -6.       -4.        4.     90236       383
          920211 144306.28       960.         -5.       -2.        4.     90236       383
          920211 144336.41       907.         -3.        1.        3.     90236       383
          920211 144346.45       889.         -3.        2.        3.     90236       383
          920211 144406.54       855.         -2.        3.        3.     90236       383
          920211 144416.59       837.         -3.        4.        2.     90236       383
          920211 144426.63       819.         -3.        5.        1.     90236       383

 21250     74.06    318.25     .0000  91 009  BH     95.67    920211
          920211 090006.51       906.         43.      -57.      -21.     89336       232
  SAT        INC    PERIOD      DRAG  INTL DESIG     R.A.      EPOCH
             DATE        TIME    ALT          ΔU      ΔV         ΔW         TAG   SENSOR


21277     99.66    109.35   -.0000  75 052    N   240.60    920212
          920211 194454.98    613.      -14.     195.      -13.     86783       329

21282     99.68    108.81   -.0000  75 052    T   244.09    920212
          920211 193756.79    638.        0.     541.       -0.     90000       329

21318     99.56    106.00   -.0022  75 052   AL   256.48    920212
          920211 060157.17    475.       39.      59.       15.     89376       232

21324     99.57    111.50   -.0008  75 052   AS   226.32    920212
          920211 101030.77    745.     -104.    -154.      -21.     94714       399

21326     99.68    107.62   -.0000  75 052   AO   251.10    920212
          920201 003122.15    590.     -121.     949.       -0.     88788       398

21338     99.49    107.99   -.0001  75 052   BG   243.06    920212
          920211 111745.94    657.       22.     569.      -17.     94717       399

21339     99.55    113.29   -.0001  75 052   8H   216.89    920212
          920211 223152.10    910.       30.    1529.      -17.     94747       399

21340     99.54    113.39   -.0073  75 052   BJ   215.32    920212
          920128 233002.62    808.     -325.   -2076.      -18.     88892       398

21341     99.73    114.67   0.0000  75 052   BK   215.53    920212
          920131 233930.20   1024.       -6.    1608.        7.     88032       398

21346     99.33    112.42   -.0025  75 052   BQ   213.95    920212
          920211 131930.21    885.     -389.   -1738.       -5.     90233       383

21360     99.67    108.38   -.0000  75 052   CE   246.40    920212
          920211 195801.70    598.     -108.    -936.       12.     86698       329

21376    100.03    108.23   -.0070  75 052   CW   255.53    920211
          920211 100402.07    498.     -226.    -589.        4.     93938       396

21390     99.88    109.57   -.0025  75 052   DL   244.42    920212
          620211 052356.69    733.     -112.   -1467.      -10.     89812       232
          920211 193756.79    638.     -240.   -1395.       -8.     90000       329

21404     73.96    136.09   0.0000  91 009   BT    74.63    920212
          920211 051401.39    886.      119.    -423.       18.     89810       232
          920211 051429.24    910.      132.    -529.       -7.     88810       232

21429     63.05    732.31   0.0000  91 043    0   316.14    920210
          920211 052307.17  21335.      -32.    1450.      -35.     89812       232
          920211 052331.74  21326.      -34.    1435.      -10.     89812       232
          920211 052356.69  21317.      -35.    1421.       15.     89812       232
          920211 052419.81  21308.      -37.    1408.       38.     89812       232

21438     99.58    108.49   -.0001  75 052   Ow   243.05    920212
          920211 195137.60    609.      -70.    -826.        2.     86776       329

21444     99.64    111.66   -.0002  75 052   EC   227.63    920212
          920209 115754.19    817.      -89.   -1036.        7.     15390       398

21446     99.67    113.40   -.0001  75 052   EE   219.81    920212
          920211 104746.33    568.     -226.    -112.      -21.     15758       396

21447    100.22    117.38   -.0117  75 052   EF   214.28    920211
          920210 201942.02   1221.       42.    -694.        9.     89207       221

21448     99.60    109.33   -.0000  75 052   EG   238.89    920212
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  SAT       INC   PERIOD      DRAG  INTL DESIG     R.A.     EPOCH
           DATE        TIME     ALT          ΔU       ΔV       ΔW        TAG    SENSOR


         920211 111637.67      642.      -140.      959.      -16.     94717      399

21452     99.75    118.02   -.0007  75 052  EL    201.12    920211
         920210 223618.82      910.      -201.      318.       18.     90220      395

21461     99.61    109.31   -.0001  75 052  EV    239.52    920212
         920211 113026.17      720.      -238.    -1747.      -19.     90223      382

21471    100.08    106.79   -.0003  75 052  FF    268.93    920212
         920211 041222.66      695.      -383.     1941.        3.     93903      396
         920211 041232.53      695.      -349.     1874.      -10.     93903      396

21475     99.77    106.48   -.0001  75 052  FK    260.47    920211
         920205 130558.03      515.      -133.     -550.        3.     88079      398

21491     99.01    104.58   -.0052  75 052  FL    245.90    920212
         920211 121422.99      537.       -43.     -283.       12.     93329      399

21499     99.66    110.26   -.0002  75 052  FO    235.16    920212
         920211 113507.79      696.       -36.     -523.        7.     94719      399

21506     99.58    110.22   -.0003  75 052  GB    233.29    920212
         920131 234351.53      677.      -340.     1825.       -5.     88032      398
         920211 223404.43      735.        -7.     1100.       -3.     94750      399

21523     99.95    121.65   -.0774  75 052  GO    179.99    920130
         920210 200720.38     1382.       146.      532.       14.     82080      222

21538     46.70    608.03   -.4623  91 046   E    211.36    920128
         920117 033604.77      856.     -1070.    -1437.        9.     21538      329
         920117 033640.50      935.     -1061.    -3417.       -0.     21538      329
         920117 033716.22     1014.     -1051.    -1393.        1.     21538      329
         920131 030344.99     1022.        68.      184.        3.     21538      329
         920203 113048.14      235.      -546.     1199.        1.     21538      387
         920203 113050.09      233.      -545.     1200.        1.     21538      387
         920207 071500.69     7892.      1281.     1444.       -9.     21538      334
         920125 150400.32       72.       -24.       65.      -50.     21538      745

21552     55.33    716.01    .0000  91 047   A    111.87    920210
         920211 172857.63    10918.      -798.     4673.       44.     90000      241
         920211 172923.67    10917.      -787.     4636.       22.     90000      241
         920211 172952.42    10616.      -775.     4596.       -2.     96000      241
         920211 173019.24    10915.      -764.     4560.      -24.     90000      241
         920211 173159.75    10911.      -712.     4388.      -34.     90001      241

21565     99.83    113.48   -.0003  75 052  HK    223.76    920211
         920206 095345.03      700.      -207.     -423.      -13.     15390      398

21567    100.05    106.85   -.0002  75 052  HM    257.28    920212
         920211 041032.30      704.       -98.    -1059.        5.     93902      396
         920211 041302.14      694.      -357.    -1725.       13.     93903      396

21594     16.56    593.16    .0038  90 065   K    176.84    920211
         920208 215615.65     3890.      -841.     5255.       -9.     15390      398

21620     46.55    244.97   -.2953  87 100   G    127.81    920211
         920211 144114.03     2841.      -224.    -4778.       24.     83999      221

21623     62.86    216.41   -.0131  87 036   L    193.30    920210
         920211 090427.59     1046.       285.      479.        1.     90436      385
         920211 090437.63     1055.       308.      449.      -30.     90436      385

21635     18.24    584.84   -.0213  98 065   M    168.33    920211
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  SAT        INC    PERIOD      DRAG  INTL DESIG     R.A.      EPOCH
             DATE      TIME      ALT          ΔU       ΔV         ΔW         TAG    SENSOR


           920211 165652.54     2785.        -84.    -2297.       -26.       8547       334
           920211 165709.41     2753.       -155.    -2297.        -2.       8547       334

 21656     82.56    109.35     .0001  91 056   B      1.38    920211
           920126 083727.69      630.        -13.       15.       -13.       3899       745

 21659     85.94    162.83    -.0033  63 014  FF    100.19    911130
           920211 083904.72     3023.       -174.    -1185.        20.      89832       232
           920211 083927.32     3035.       -181.    -1248.        13.      89832       232
           920211 084013.83     3060.       -196.    -1379.        -2.      89832       232
           920211 084039.55     3075.       -204.    -1451.        10.      89832       232
           920211 084103.66     3089.       -212.    -1519.       -17.      89832       232
           920211 084126.91     3103.       -220.    -1584.       -24.      89832       232

 21660     85.88    164.08    -.0004  63 014  FG     71.31    920204
           920211 131426.94     2075.       -166.    -2709.       -18.      94593       399

 21670     28.63    638.62    -.0141  91 060   C     81.74    920128
           920210 195115.32    12943.       -918.    -5205.       -10.      89207       221
           920210 195202.62    12886.       -921.    -5206.         3.      89207       221
           920210 195250.54    12827.       -924.    -5208.        16.      89207       221
           920210 195337.45    12770.       -927.    -5209.        29.      89207       221

 21678     99.95    111.10    -.0003  75 052  JE    239.39    920212
           920211 111637.67      642.       -227.     -290.        10.      94717       399

 21686    100.01    106.54    -.0014  75 052  JN    267.04    920211
           920211 041302.14      694.       -157.     1381.        16.      93903       396

 21691     89.64    100.54    -.0003  91 045   E    184.00    920211
           920211 043739.26      444.       -331.     1618.         3.      86777       329

 21692     27.42    461.85    -.0027  67 001  AU    165.89    920105
           920114 201731.99     1225.       -152.      304.        -1.      21692       398
           920114 201825.03     1129.       -150.      312.        -1.      21692       398
           920114 201849.91     1086.       -147.      313.        -0.      21692       398
           920114 201914.79     1042.       -147.      318.        -1.      21692       398
           920114 201939.79     1000.       -145.      321.        -1.      21692       398
           920114 202005.10      957.       -143.      325.        -0.      21692       398
           920114 202030.50      616.       -142.      327.        -1.      21692       398
           920114 202056.60      875.       -139.      330.         0.      21692       398
           920114 202122.58      834.       -137.      334.        -0.      21692       398
           920114 202149.61      792.       -136.      336.         0.      21692       398
           920114 202222.47      744.       -131.      342.         1.      21692       398

 21723     65.72    106.86    -.0024  71 015  0w    190.22    920211
           920211 203747.63      362.       -279.      435.       -18.       4942       399
           920211 023536.23      644.        -10.     1424.       -12.      86797       329
           920211 023952.93      673.        173.      566.       -14.      86712       329

 21743     73.99     93.53    -.0130  91 072   A    330.79    920231
           920211 195434.07      354.        194.      257.         2.      82082       243

 21764     40.99    615.37    -.4851  91 074   F    241.06    920208
           920211 212636.05     4565.        147.      205.       -10.      21764       399
           920211 213727.27     5947.        140.      174.        -6.      21764       399
           920211 002941.04      666.         61.      208.        -1.      90000       329
           920211 002959.25      700.         65.      209.         0.      90001       329

 21777     18.32    600.54    -.0011  90 065   0    189.74    920210
           920211 123620.44     3330.        715.     4871.        29.      88629       334
           920211 123643.88     3381.        828.     4815.        26.      88629       334
           920211 123751.07     3531.       1133.     4642.        28.      88629       334
  SAT       INC    PERIOD     DRAG  INTL DESIG     R.A.     EPOCH
            DATE      TIME     ALT        ΔU        ΔV       ΔW        TAG    SENSOR


 21819     82.57    121.62   -.0008  91 086   A    139.15    920712
           920211 061450.98    281.       -0.       -81.      11.     87329      396
           920211 061501.05    283.       -0.       -81.      11.     87329      396
           920211 081725.53    313.       13.       169.       8.     87329      396
           920211 081735.39    317.       14.       168.       8.     87329      396
           920211 081745.26    320.       15.       168.       8.     87329      396
           920211 100911.49    409.      154.      -266.     -12.     89813      232

 21827     82.51    121.42   -.0064  91 086   0    139.19    920211
           920210 233944.99    519.     -319.       957.     -17.     90000      329

 21834     31.06    110.72   -.0475  91 088   B     50.75    920212
           920210 093716.01    316.       58.      -998.     -14.     15390      398
           920210 093807.19    360.       96.     -1003.      13.     15390      398

 21835     82.57    121.63   -.0016  91 086   E    139.16    920212
           920211 061450.98    281.        7.       311.      11.     87329      396
           920211 061503.05    283.        8.       311.      11.     87329      396
           920211 081725.53    313.       -1.       563.       8.     87329      396
           920211 081735.39    317.        3.       562.       8.     87329      396
           920211 081745.26    320.        1.       561.       8.     87329      396

 21839    100.07    100.49   -.0039  70 025  QK    203.95    920211
           920210 200554.17    455.       49.      -433.     -11.     82080      222

 21848     62.74     90.48   -.1693  92 003   B     20.64    920212
           920204 111031.90    207.      -60.      -896.      -3.     88079      398
           920209 095244.27    186.       47.       365.       6.     88079      398

 21854     64.82    668.22   -.0068  92 005   B    137.93    920206
           920211 022437.88  10305.      -95.     -2152.       1.     21854      369
           920211 022512.38  10305.      -95.     -2151.       0.     21854      369
           920211 022554.38  10305.      -96.     -2152.       1.     21854      369
           920211 022627.02  10305.      -96.     -2154.       2.     21854      369
           920211 022659.99  10305.      -97.     -2155.       3.     21854      369
           920211 022740.76  10305.      -98.     -2155.       1.     21854      369
           920211 022813.91  10305.      -99.     -2156.       0.     21854      369
           920211 022838.87  10305.      -99.     -2155.       0.     21854      369
           920211 022911.54  10305.      -99.     -2156.       1.     21854      369
           920211 022936.74  10305.     -100.     -2156.       2.     21854      369
           920211 023010.85  10305.     -101.     -2157.       1.     21854      369
           920211 023037.46  10305.     -101.     -2158.       1.     21854      369
           920211 023102.33  10305.     -102.     -2158.       1.     21854      369
           920211 023127.17  10305.     -102.     -2159.       1.     21854      369
           920211 023152.07  10305.     -102.     -2359.       1.     21854      369
           920211 023208.99  10305.     -103.     -2158.       1.     21854      369
           920211 023246.49  10305.     -103.     -2160.       1.     21854      369
           920211 023312.71  10305.     -104.     -2160.       0.     21854      369
           920211 023346.94  10305.     -104.     -2160.       1.     21854      369
           920211 023416.01  10305.     -105.     -2159.       1.     21854      369
           920211 030327.21  10306.     -133.     -2176.      -2.     21854      369
           920211 030353.06  10306.     -133.     -2175.      -0.     21854      369
           920211 030440.74  10306.     -133.     -2176.      -1.     21854      369
           920211 030512.72  10306.     -134.     -2176.      -0.     21854      369
           920211 030543.80  10306.     -134.     -2176.      -1.     21854      369
           920211 030608.63  10306.     -135.     -2176.      -1.     21854      369
           920211 030639.26  10306.     -135.     -2176.      -1.     21854      369
           920211 030710.23  10306.     -135.     -2177.       0.     21854      369
           920211 030741.14  10306.     -136.     -2178.       0.     21854      369
           920211 030819.11  10306.     -136.     -2178.      -0.     21854      369
           920211 030916.93  30306.     -137.     -2178.      -0.     21854      369
           920211 031003.22  10306.      138.     -2177.       0.     21854      369
           920211 031034.16  10306.     -138.     -2177.      -1.     21854      369
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SAT          INC    PERIOD       DRAG  INTL DESIG     R.A.     EPOCH
             DATE        TIME      ALT         ΔU        ΔV        ΔW       TAG   SENSOR


           920211 031105.07    10306.     -138.    -2176.       -1.     21854      369
           920211 031136.06    10306.     -139.    -2176.       -1.     21854      369
           920211 035325.95    10311.     -163.    -2170.       -3.     21854      369
           920211 035421.37    10311.     -164.    -2170.       -2.     21854      369
           920211 035502.62    10312.     -164.    -2372.       -1.     21854      369
           920211 035530.55    10312.     -164.    -2172.        0.     21854      369
           920211 035558.37    10312.     -164.    -2172.        1.     21854      369
           920211 035639.62    10312.     -164.    -2172.        1.     21854      369
           920211 035721.07    10312.     -165.    -2173.        0.     21854      369
           920211 035816.75    10312.     -165.    -2172.       -0.     21854      369
           920211 035911.97    10312.     -165.    -2171.       -1.     21854      369
           920211 040006.30    10312.     -166.    -2171.       -1.     21854      369
           920211 040101.95    10312.     -166.    -2171.       -1.     21854      369
           920211 040145.12    10313.     -166.    -2171.       -1.     21854      369
           920211 040214.22    10313.     -167.    -2171.       -2.     21854      369
           920211 040242.32    10313.     -167.    -2171.       -2.     21854      369
           920211 040311.82    10313.     -167.    -2171.       -1.     21854      369
           920211 041331.80    10316.     -168.    -2161.       -3.     21854      404
           920211 041412.94    10313.     -173.    -2172.        8.     21854      404
           920211 041454.07    10317.     -167.    -2160.      -11.     21854      404
           920211 041535.20    10336.     -169.    -2163.       -4.     21854      404
           920211 041616.34    10315.     -172.    -2180.      -20.     21854      404
           920211 041657.47    10316.     -170.    -2169.      -10.     21854      404
           920211 041736.61    10315.     -171.    -2167.       -4.     21854      404
           920211 041819.74    10315.     -172.    -2171.       -5.     21854      404
           920211 041900.87    10715.     -173.    -2175.      -11.     21854      404
           920211 041942.01    10317.     -169.    -2164.      -13.     21854      404
           920211 042023.14    10315.     -173.    -2168.        1.     21854      404
           920211 042104.28    10313.     -176.    -2179.       -1.     21854      404
           920211 042145.41    10315.     -174.    -2176.      -10.     21854      404
           920211 042226.55    10318.     -167.    -2150.        1.     21854      404
           920211 042307.68    10315.     -174.    -2169.        2.     21854      404
           920211 042348.81    10316.     -174.    -7173.       -8.     21854      404
           920211 042429.95    10315.     -174.    -2169.       -0.     21854      404
           920211 042511.08    10314.     -176.    -2172.        5.     21854      404
           920211 042552.22    10315.     -175.    -2175.       -6.     21854      404
           920211 042633.35    10312.     -161.    -2189.        0.     21854      404
           920211 050100.73    10324.     -169.    -2144.        1.     21854      369
           920211 050142.24    10324.     -169.    -2143.        0.     21854      369
           920211 050213.09    10324.     -169.    -2143.       -0.     21854      369
           920211 050242.85    10324.     -169.    -2143.       -0.     21854      369
           920211 050313.59    10324.     -169.    -2142.       -0.     21854      369
           920211 050350.93    10325.     -169.    -2142.        0.     21854      369
           920211 050435.26    10324.     -168.    -2141.        1.     21854      369
           920211 050515.15    10325.     -168.    -2140.        1.     21854      369
           920211 050552.43    10325.     -168.    -2140.        3.     21854      369
           920211 050629.74    10325.     -168.    -2140.       -1.     21854      369
           920211 174937.89    10342.     -297.    -3073.       -4.     21854      399
           920211 175314.87    10342.     -295.    -3079.       -9.     21854      399

21855      64.83    675.32   0.0000  92 005    C    138.00    920208
           920211 021948.96    10336.        7.     -365.       11.     21855      399
           920211 022310.84    10334.        5.     -374.        8.     21855      399
           920211 023045.83    10337.        7.     -368.       11.     21855      399
           920211 023517.83    10335.        4.     -373.        4.     21855      399
           920211 023724.93    10336.        5.     -364.        3.     21855      369
           920211 023810.46    10336.        6.     -365.        4.     21855      369
           920211 023855.39    10337.        6.     -364.        3.     21855      369
           920211 023940.69    10337.        5.     -364.        3.     21855      369
           920211 023942.32    10337.        6.     -362.        2.     21855      399
           920211 024024.89    10337.        5.     -365.        4.     21855      369
           920211 024054.78    10337.        6.     -364.        4.     21855      369
           920211 024124.70    10337.        6.     -364.        4.     21855      369
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SAT        INC   PERIOD      DRAG  INTL DESIG    R.A.     EPOCH
          DATE       TIME     ALT         ΔU       ΔV       ΔW       TAG    SENSOR


         920211 024155.61   10337.         5.     -364.      4.     21855      369
         920211 024227.47   10337.         6.     -364.      4.     21855      369
         920211 024258.58   10337.         6.     -364.      5.     21855      369
         920211 024300.64   10336.         5.     -363.      2.     21855      399
         920211 024328.63   10337.         6.     -364.      5.     21855      369
         920211 024613.63   10338.         7.     -368.     12.     21855      399
         920211 052003.77   10334.        -5.     -373.     -1.     21855      369
         920211 052054.18   10334.        -5.     -375.     -2.     21855      369
         920211 052118.50   10334.        -5.     -376.     -3.     21855      369
         920211 052149.09   10334.        -5.     -376.     -3.     21855      369
         920211 052220.36   10334.        -5.     -376.     -3.     21855      369
         920211 052250.49   10334.        -5.     -376.     -3.     21855      369
         920211 052327.89   10334.        -5.     -376.     -3.     21855      369
         920211 052406.71   10334.        -5.     -376.     -4.     21855      369
         920211 052435.60   10334.        -5.     -376.     -5.     21855      369
         920211 052506.65   10334.        -5.     -376.     -5.     21855      369
         920211 052543.75   10334.        -5.     -377.     -4.     21855      369

21858    64.81    675.38   0.0000  92 005    F   137.86   920211
         920211 021948.96   10336.       -53.    -1323.      2.     21855      399
         920211 022310.84   10334.       -55.    -1332.     -1.     21855      399
         920211 023045.83   10337.       -53.    -1326.      3.     21855      399
         920211 023517.83   10335.       -55.    -1330.     -5.     21855      399
         920211 023724.93   10336.       -53.    -1322.     -5.     21855      369
         920211 023810.46   10336.       -53.    -1322.     -4.     21855      369
         920211 023855.39   10337.       -53.    -1321.     -5.     21855      369
         920211 023940.69   10337.       -53.    -1322.     -5.     21855      369
         920211 023942.32   10337.       -52.    -1319.     -6.     21855      399
         920211 024024.89   10337.       -53.    -1323.     -5.     21855      369
         920211 024054.78   10337.       -52.    -1322.     -4.     21855      369
         920211 024124.70   10337.       -52.    -1322.     -4.     21855      369
         920211 024155.61   10337.       -53.    -1322.     -5.     21855      369
         920211 024227.47   10337.       -52.    -1322.     -4.     21855      369
         920211 024258.58   10337.       -52.    -1321.     -3.     21855      369
         920211 024300.64   10336.       -53.    -1321.     -6.     21855      399
         920211 024328.63   10337.       -52.    -1322.     -3.     21855      369
         920211 024613.63   10338.       -51.    -1326.      4.     21855      399
         920211 052003.77   10334.       -58.    -1348.      0.     21855      369
         920211 052054.18   10334.       -58.    -1350.     -0.     21855      369
         920211 052118.50   10334.       -58.    -1351.     -1.     21855      369
         920211 052149.09   10334.       -53.    -1351.     -1.     21855      369
         920211 052220.36   10334.       -58.    -1351.     -1.     21855      369
         920211 052250.49   10334.       -58.    -1351.     -1.     21855      369
         920211 052327.89   10334.       -58.    -1353.     -2.     21855      369
         920211 052405.71   10334.       -58.    -1351.     -2.     21855      369
         920211 052435.60   10334.       -59.    -1352.     -3.     21855      369
         920211 052506.65   10334.       -59.    -1352.     -3.     21855      369
         920211 052543.75   10334.       -59.    -1353.     -2.     21855      369

21859     3.67    133.83   -.3288  71 096    C   235.32   920211
         920211 173725.84    1025.       448.     1089.    -18.     90003      241
         920211 174433.94     979.       130.     -688.    -21.     89417      242
         920211 174443.66    1004.       143.     -714.    -15.     89415      241
         920211 174459.73    1045.       156.     -797.     -6.     89417      242
         920211 174508.59    1068.       168.     -819.     -0.     89415      241
         920211 174525.20    1112.       180.     -906.     10.     89417      242

21860    51.72    265.66   -.8716  83 127    L   251.28   920207
         920211 225929.42    1601.       590.    -1601.    -23.     94752      399

21869    73.99     89.84   -.0854  90  36    N    71.77   920211
         920211 183414.27     124.       -50.      497.     -0.     82061      393
         920211 183437.73     127.       734.      387.     -1.     82062      393
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SAT	INC	PERIOD	DRAG	INTL DESIG	R.A.	EPOCH		
	DATE	TIME	ALT	ΔU	ΔV	ΔW	TAG	SENSOR
	920211	183437.80	127.	-36.	405.	-2.	82060	393
	920211	183449.70	128.	-27.	334.	-1.	82063	393
	920211	183505.27	125.	-50.	498.	-1.	82061	393
	920211	183528.97	127.	-35.	4061	-2.	82060	393
	920211	183529.03	127.	-33.	388.	-1.	82062	393
	920211	183540.87	129.	-27.	335.	-1.	82063	393
	920211	183555.27	125.	-50.	499.	-1.	82061	393
	920211	183618.97	127.	-36.	407.	-2.	82060	393
	920211	183619.03	127.	-33.	389.	-1.	82062	393
	920211	183630.87	128.	-27.	336.	-2.	82063	393
	920211	183645.27	125.	-50.	501.	-1.	82061	393
	920211	183708.97	128.	-35.	408.	-2.	82060	393
	920211	183709.03	128.	-33.	390.	-1.	82062	393
	920211	183720.87	129.	-27.	337.	-2.	82063	393
	920211	183735.50	125.	-50.	502.	-1.	82061	393
	920211	183759.13	128.	-35.	409.	-2.	82060	393
	920211	183759.23	128.	-34.	391.	-1.	82062	393
	920211	183811.07	129.	-27.	338.	-2.	82063	393
	920211	153245.25	133.	-21.	313.	-2.	90020	329
	920211	170643.38	134.	-17.	278.	-6.	90000	329
	920211	105114.03	127.	-197.	1120.	10.	94117	395
21870	73.98	89.75	-.0931	90 38 P	71.60	920211		
	920211	105114.03	127.	-197.	1124.	10.	94117	393
	920211	183338.67	121.	-60.	550.	1.	82081	393
	920211	183414.27	124.	-36.	400.	1.	82061	393
	920211	183429.73	121.	-60.	552.	1.	82081	393
	920211	183437.73	127.	-23.	289.	0.	82062	393
	920211	183437.80	127.	-24.	308.	-1.	82060	393
	920211	183449.70	128.	-18.	237.	-0.	82063	393
	920211	183505.27	125.	-36.	401.	1.	82061	393
	920211	183519.73	121.	-60.	553.	1.	82081	393
	920211	183528.97	127.	-24.	309.	-1.	82060	393
	920211	183529.03	127.	-23.	290.	-0.	82062	393
	920211	183540.87	129.	-18.	238.	-0.	82063	393
	920211	183555.27	125.	-36.	402.	1.	82061	393
	920211	183609.77	121.	-60.	555.	1.	82081	393
	920211	183618.97	127.	-24.	309.	-1.	82060	393
	920211	183619.03	127.	-23.	291.	0.	82062	393
	920211	183636.87	128.	-18.	239.	-0.	82063	393
	920211	183645.27	125.	-36.	403.	0.	82061	393
	920211	183659.87	121.	-61.	556.	1.	82081	393
	920211	183708.97	128.	-24.	310.	-1.	82060	393
	920211	183709.03	128.	-23.	292.	0.	82062	393
	920211	183720.87	129.	-18.	239.	-0.	82063	393
	920211	183735.50	125.	-36.	405.	0.	82061	393
	920211	183759.13	128.	-24.	311.	-1.	82060	393
	920211	183759.23	128.	-23.	293.	0.	82062	393
	920211	183811.07	129.	-18.	240.	-0.	82063	393
	920211	153245.25	133.	-15.	256.	-1.	90020	329
	920211	170643.38	134.	-10.	200.	-5.	90000	329
21871	73.99	89.71	-.0965	90 38 0	71.16	920211		
	920211	105114.03	127.	-191.	1116.	9.	94117	393
	920211	153245.25	133.	-12.	229.	-2.	96020	329
	920211	170643.38	134.	-7.	157.	-5.	90000	329
	920211	183414.27	124.	-31.	362.	0.	82061	393
	920211	183429.73	121.	-53.	514.	1.	82081	393
	920211	183437.73	127.	-19.	251.	-0.	82062	393
	920211	183437.80	127.	-20.	269.	-1.	82060	393
	920211	183449.70	128.	-14.	199.	-1.	82063	393
	920211	183505.27	125.	-31.	363.	0.	82061	393
	920211	183528.97	127.	-20.	270.	2.	82060	393

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 SAT        INC    PERIOD      DRAG  INTL DESIG     R.A.     EPOCH
            DATE       TIME     ALT         ΔU       ΔV        ΔW       TAG    SENSOR


           920211 183529.03     327.      -19.      252.      -1.     82060     393
           920211 183540.87     129.      -14.      199.      -1.     82063     393
           920211 183555.27     125.      -31.      364.      -0.     82061     393
           920211 183609.77     321.      -54.      517.       0.     82081     393
           920211 183618.97     127.      -20.      271.      -1.     82060     393
           920211 183619.03     127.      -19.      253.      -0.     82062     393
           920211 183630.87     128.      -14.      200.      -1.     82063     393
           920211 183645.27     125.      -31.      365.      -0.     82061     393
           920211 183659.87     121.      -54.      518.       0.     82081     393
           920211 183708.97     128.      -20.      272.      -1.     82060     393
           920211 183709.03     128.      -19.      254.      -0.     82062     393
           920211 183720.87     129.      -14.      201.      -1.     82063     393
           920211 183735.50     125.      -31.      366.      -0.     82061     393
           920211 183759.13     128.      -20.      273.      -1.     82060     393
           920211 183759.23     128.      -19.      255.      -1.     82062     393
           920211 183811.07     129.      -15.      202.      -1.     82063     393

 21872     73.99     89.60   -.1171   93  38    R    71.15    920211
           920211 105114.03     127.     -174.     1106.       9.     94117     393
           920211 153245.25     133.        7.      115.      -2.     90020     329
           920211 170643.38     134.        7.       19.      -5.     90000     329
           920211 183338.67     121.      -21.      343.       0.     82081     393
           920211 183414.27     124.       -6.      191.      -0.     82061     393
           920211 183429.73     121.      -21.      343.       0.     82081     393
           920211 183437.73     127.        0.       79.      -0.     82062     393
           920211 183437.80     127.       -0.       97.      -2.     82060     393
           920211 183449.70     128.        2.       26.      -1.     82063     393
           920211 183505.27     125.       -7.      191.      -0.     82061     393
           920211 183519.73     121.      -22.      343.       0.     82081     393
           920211 183528.97     127.       -1.       97.      -2.     82060     393
           920211 183529.03     127.        0.       79.      -1.     82062     393
           920211 183540.87     129.        2.       26.      -1.     82063     393
           920211 183555.27     125.       -7.      191.      -0.     82061     393
           920211 183609.77     121.      -23.      344.      -0.     82081     393
           920211 183618.97     127.       -1.       97.      -2.     82060     393
           920211 183619.03     127.       -1.       78.      -1.     82062     393
           920211 183630.87     128.        1.       25.      -1.     82063     393
           920211 183645.27     325.       -8.      193.      -0.     82063     393
           920211 183659.87     121.      -23.      344.      -0.     82081     393
           920211 183708.97     128.       -2.       96.      -2.     82060     393
           920211 183709.03     128.       -1.       78.      -1.     82062     393
           920211 183720.87     129.        0.       25.      -1.     82063     393
           920211 183735.50     125.       -9.      191.      -0.     82061     393
           920211 183759.13     128.       -2.       96.      -2.     82060     393
           920211 183759.23     128.       -2.       78.      -1.     82062     393
           920211 183811.07     129.       -0.       25.      -1.     82063     393

 81005     82.35    121.06   -.0091   00 000     0   325.47    920211
           920211 194026.24     540.      -42.     1618.      -3.     87272     396

 81061     62.31    237.96   -.1899   00 000     0    84.12    920211
           920211 065634.61     357.     -459.     1824.       3.     18955     396
           920211 065644.48     357.     -418.     1762.     -30.     18955     396

 87037     99.64    112.85   -.0004   75 052     0   221.52    920212
           920211 221310.03     796.     -179.     1751.       0.     94747     399

 87117      3.90    199.68   -.0975   00 000     0   127.64    920208
           920211 000946.59    1539.      151.     -448.      -0.     94258     399
           920211 104520.79     706.     -229.     -601.       1.     94258     399
           920211 104551.42     744.     -231.     -597.       2.     87117     399
           920211 141607.67    1634.     -250.     -528.       1.     87117     399
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  SAT       INC    PERIOD      DRAG  INTL DESIG     R.A.     EPOCH
            DATE       TIME     ALT          ΔU      ΔV        ΔW        TAG    SENSOR


 87151     65.71    107.84   -.0021  71 015    0     82.17    920211
           920211 131309.37     252.      -214.    -1038.       -3.     94145        393

 87153     98.87     99.70   -.0344  78 096    0    105.73    920209
           920211 041108.28     402.        -6.      219.       -0.     87153        399
           920211 175600.24     404.        -9.      287.       -1.     93974        396
           920211 175615.11     404.        -9.      287.       -1.     93974        396
           920211 175625.98     404.        -9.      286.       -1.     93974        396
           920211 175635.85     404.        -9.      286.       -1.     93974        396
           920211 175645.72     404.        -9.      267.       -1.     93974        396

 87207     51.15    128.47   -.0004  00 000    0     47.50    920104
           920211 073348.76     976.        60.     -876.       -9.     89376        232
           920211 073408.84     993.        66.     -960.        7.     89376        232
           920211 073534.40    1095.        25.    -1564.        8.     89812        232
           920211 094501.10     775.         1.      -24.       14.     89832        233

 87210     62.12    111.89    .0072  68 097    0    127.16    920116
           920211 051646.07     501.        13.      769.      -13.     89810        232

 87241    104.02    127.72   -.0063  76 077    0     50.30    920211
           920211 223510.96     847.      -322.    -1797.       -2.     94750        399

 87272     60.52    129.81   -.0143  00 000    0    239.98    920211
           920120 015332.70     347.      -448.      388.       22.     87302        396
           920120 015342.56     347.      -453.      366.      -36.     87302        396
           920211 194016.37     534.        19.       -9.       20.     87272        396
           920211 194026.24     540.        19.      -10.       21.     87272        396
           920211 194036.11     547.        19.      -10.       21.     87272        396

 87295     46.57    144.24   -.1454  00 000    0     57.54    920211
           920211 110649.27     338.      -384.     1538.      -21.     94716        399

 87301     26.04    189.44   -.1189  00 000    0    267.43    920202
           920211 225812.65    1443.       190.     -683.       23.     94752        399

 87302     99.15     97.00   -.0206  75 052    0    244.14    920209
           920120 125531.79     343.      -362.    -1616.        0.     87302        396
           920120 125541.67     343.      -362.    -1616.        1.     87302        396
           920120 125551.53     343.      -362.    -1616.        0.     87302        396
           920121 021310.78     347.      -285.    -1427.        4.     87302        396
           920121 021320.64     346.      -285.    -1428.        4.     87302        396
           920121 021330.51     346.      -285.    -1427.        4.     87302        396
           920122 023430.37     346.      -171.    -1106.        4.     87302        396
           920122 023446.24     346.      -171.    -1106.        4.     87302        396
           920122 023456.12     346.      -171.    -1105.        4.     87302        396
           920122 120013.03     343.      -131.     -989.       -0.     87302        396
           920122 120022.94     343.      -131.     -989.        0.     87302        396
           920122 120032.77     343.      -131.     -989.       -0.     87302        396
           920124 123825.29     344.       -30.     -498.       -0.     87302        396
           920124 123835.16     344.       -30.     -498.       -0.     87302        396
           920124 123845.03     344.       -30.     -499.       -0.     87302        396

 87306     62.22    101.20   -.0059  61 OMI    0    352.31    920207
           920201 222215.38     303.      -350.     1268.       18.     19994        399

 87308     82.61    122.05   -.0079  91 086    0    139.67    920211
           920211 061450.98     281.      -159.     -847.       20.     87329        396
           920211 061501.05     283.      -160.     -847.       19.     87329        396
           920211 081725.53     313.       -73.     -492.       14.     87329        390
           920211 081735.39     317.       -74.     -492.       14.     87329        396
           920211 081745.26     320.       -74.     -492.       13.     87329        396
  SAT        INC   PERIOD      DRAG  INTL DESIG     R.A.     EPOCH
             DATE       TIME    ALT         ΔU        ΔV       ΔW        TAG    SENSOR


 87309     74.39    163.74   -.0585  00 000   0    198.61    920211
          920209 210835.47     284.       -40.    1121.       -8.     19994       399

 87314     82.53    120.60   -.0082  91 086   0    138.81    920211
          920211 130624.00     270.         2.       1.        6.     90017       329

 87316     98.11    107.29   -.0012  78 026   0    358.70    920123
          920210 223358.66     779.       -15.     -72.       12.     89407       242
          920210 223430.21     764.       -31.    -187.       20.     89407       242

 87328     31.87     95.13   -.6793  91 088   0     54.42    920206
          920211 092159.30     415.       164.    -248.      -13.     89376       232

 87332     98.75     93.90   -.1123  86 019   0    295.43    920210
          920211 125447.90     237.       -37.     516.        0.     94139       393
          920211 125625.30     238.       -36.     515.        1.     94139       393
          920211 125801.27     238.       -36.     516.        0.     94139       393
          920211 125935.77     239.       -37.     516.        1.     94139       393
          920211 130111.60     239.       -37.     515.        0.     94139       393

 87333     82.95    109.87   -.1881  68 091   0    120.92    920210
          920211 094315.63     161.      -212.     247.        6.     89376       232
          920211 094337.68     180.      -200.     199.        5.     89376       232
          920211 094359.73     204.      -183.     161.        6.     89376       232
          920211 094421.36     232.      -162.     131.        8.     89376       232
          920211 191017.87     788.      -114.     558.        1.     95222       393

 87334    102.45    122.73   -.0006  76 077   0    344.32    920209
          920211 182436.04     987.       121.     581.       -2.     93979       396

 87336    100.28    106.95   -.0008  70 025   0    189.44    920129
          920211 095954.57     589.        -7.     221.       -1.     93937       396
          920211 100004.44     588.        -7.     221.       -1.     93937       396
          920211 100014.31     588.        -6.     221.       -0.     93937       396
          920211 100024.22     588.        -7.     221.       -0.     93937       396
          920211 100034.02     588.        -6.     221.       -3.     93937       396

 87338     26.46    185.47   -.2059  00 000   0     36.02    911231
          920211 083843.59    1927.      -555.   -4430.       27.     89832       232

 87345     64.78    139.40   -.0760  00 000   0     37.32    920210
          920211 080948.96     428.         7.     -64.       -9.     90000       329
          920211 081032.68     400.         1.     -66.       -3.     90000       329
          920211 081128.50     377.         4.     -68.       -3.     90000       329

 87346     69.91    107.91   -.0005  85 066   0     34.39    920212
          920210 094148.35     603.       -90.     342.        6.     15390       398
          920211 064807.63     583.        -7.       3.       -8.     90000       329
          920211 083930.42     609.         5.       5.      -12.     90000       329
          920211 193756.79     688.        -7.       0.        6.     90000       329
          920211 212117.31     627.        -1.      -2.        7.     90000       329
          920211 212219.81     626.        -6.      -4.      -12.     90024       329
          920211 212322.30     623.       -13.       5.        0.     90000       329

 87348     70.12     99.22   -.0011  69 082   0    177.89    920120
          920211 135325.93     391.      -171.   -1335.        2.     95217       393

 87351     25.90    119.75   -.2398  00 000   0    267.43    920116
          920209 151846.06    1040.      -270.     484.       15.     88079       398

 87353     28.05    107.97   -.0020  77 065   0    159.21    920111
          920211 050842.67     671.      -174.    1672.       16.     89376       232
          920211 050905.44     625.      -169.    1532.        2.     89376       232
  SAT      INC    PERIOD     DRAG  INTL DESIG     R.A.     EPOCH
           DATE       TIME    ALT         ΔU       ΔV        ΔW        TAG   SENSOR


         920211 050926.67     584.     -167.     1405.     -11.     89376       232

87356    97.61     94.97   -.0374  86 019   0   145.60    920203
         920211 130900.40     263.     -219.     1279.       3.     94144       393
         920211 130911.10     263.     -219.     1279.       3.     94144       393
         920211 130925.67     262.     -219.     1279.       4.     94144       393
         920211 130935.93     262.     -219.     1279.       4.     94144       393

87360    82.81     99.01   -.0310  81 053   0   352.34    920207
         920211 070828.20     284.     -139.     1275.     -11.     86771       329

87365    73.48    103.36   -.0847  87 020   0   166.02    920207
         920211 100130.79     493.       -1.      348.      -2.     93938       396
         920211 100402.07     498.        2.      343.      -3.     93938       396

87371    46.64    146.55   -.2240  00 000   0    77.26    920202
         920211 085601.02    1307.      -88.     -721.      14.     89336       232
         920211 085640.36    1300.      -80.     -851.      -1.     89336       232
         920211 085711.05    1298.      -73.     -955.      -9.     89336       232
         920211 085815.66    1303.      -59.    -1180.     -19.     89336       232
         920211 085851.19    1312.      -52.    -1308.     -20.     89336       232
         920211 085934.81    1328.      -43.    -1470.     -17.     89336       232
         920211 090006.51    1344.      -37.    -1592.     -12.     89336       232

87372    64.71    201.69    .0151  00 000   0     1.82    920211
         920211 090543.31     883.       17.      -10.      -0.     93721       399

87373    82.96    103.59   -.0002  81 053   0   145.06    920125
         920211 061147.69     490.      -17.      347.       1.     93915       396
         920211 061157.56     490.      -17.      347.       1.     93915       396
         920211 061207.43     489.      -18.      347.       1.     93915       396
         920211 061217.30     489.      -18.      347.       1.     93915       396

87376    70.08    100.30   -.0007  69 082   0   167.80    920124
         920211 182446.10     406.      -46.      591.       0.     95201       393
         920211 182608.23     406.      -46.      592.       0.     95201       393
         920211 182730.53     400.      -46.      591.      -0.     95201       393
         920211 182853.30     406.      -46.      591.      -0.     95201       393
         920211 183000.53     406.      -46.      562.      -1.     95201       393

87380    65.83    105.59   -.0001  77 121   0    77.65    920125
         920210 094052.78     535.     -398.    -1794.     -18.     15390       398

87383    62.27    113.97   -.0007  68 093   0    69.92    920212
         920211 113638.86     985.     -211.      902.     -19.     90447       385
         920211 113648.71    1001.     -183.      844.      20.     90447       385
         920211 113747.66     932.     -197.     -497.      -7.     94719       399

87386    62.88    127.53   -.6808  00 000   0    27.22    920210
         920210 211939.45    1908.       20.     1362.      -0.     89298       221

87387    70.39    101.48   -.0016  69 082   0   161.43    920128
         920231 185325.93     391.      -94.      862.       1.     95217       393

87390   100.41    105.41   -.0004  70 025   0    83.28    920130
         920211 153334.38     506.      -82.      744.      10.     94638       399

87394    23.44    136.41   -.3651  00 000   0   166.86    920207
         920211 094420.21     338.        7.     -958.      20.     87394       399
         920211 094511.78     301.       -5.     -964.      19.     87394       399
         920211 094657.86     234.      -30.     -975.      17.     94149       399
         920211 094754.22     202.      -44.     -980.      15.     94149       399
         920211 143508.67     151.     -257.    -1039.      -7.     94149       399
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   SAT         INC   PERIOD      DRAG  INTL DESIG     R.A.     EPOCH
                DATE      TIME     ALT        ΔU       ΔV       ΔW         TAG    SENSOR


 87395      62.79     91.24    -.0893  92 003   0     45.90    920205
            920209 095244.27     186.     -257.   -1462.       3.      88079       398

 87398      23.04    142.23    -.0583  00 000   0    358.13    920207
            920211 050842.67     214.       61.     -45.      -5.      89376       232
            920211 050905.44     267.      120.     -96.      24.      89376       232

 87403      84.11    140.97    -.2335  00 000   0    237.06    920206
            920211 121038.61    1266.       61.    -101.     -17.      83999       222

 87455      63.45    176.21    -.0184  87 036   0     52.34    920212
            920211 053635.68    2045.      -82.     171.      -3.      89812       232
            920211 053724.35    2144.      -38.      81.      -3.      89812       232
            920211 053749.34    2196.      -16.      34.      -3.      89812       232
            920211 053816.92    2252.        9.     -18.      -3.      89812       232
            920211 053905.00    2352.       51.    -111.      -3.      89812       232
            920211 053934.41    2413.       77.    -168.      -3.      89812       232
            920211 054001.99    2470.      101.    -223.      -3.      89812       232
            920211 054029.14    2526.      124.    -277.      -3.      89812       232

 87568      27.25    104.08    -.1546  77 065   0    103.30    920204
            920211 051807.34     835.      164.    -169.      15.      94699       399

 87660      73.95    118.13    0.0000  91 009   0     92.00    920211
            920211 084538.84     921.     -192.    1405.     -14.      89335       232

 87711      61.97    200.83    -.0078  78 020   0     90.44    920211
            920211 092047.21    5333.      121.   -6336.       1.      89376       232
            920211 092111.34    5330.       89.   -6401.      -1.      89376       232
            620211 092134.88    5327.       56.   -6463.      -3.      89376       232
            920211 092159.30    5324.       20.   -6529.      -5.      39376       232

 87715      63.30     99.59    -.2496  00 000   0    190.19    920210
            920211 003102.63     453.       -2.      -6.       0.      90000       329

 87855      84.25    144.63    -.0946  00 000   0    335.86    920211
            920211 051730.95     821.      489.    -731.     -14.      94699       399

 87869      65.00     96.26    -.0468  83 044   0     35.91    920206
            920211 012726.24     275.       -6.    -238.       1.      93888       396
            920211 012736.11     276.       -5.    -238.       1.      93888       396
            920211 012745.98     276.       -5.    -238.       1.      93888       396
            920211 012755.85     276.       -6.    -238.       1.      93888       396
            920211 012805.72     277.       -6.    -239.       1.      93888       396
            920211 220531.05     268.       -3.    -245.       2.      94745       399
            920211 220558.32     268.       -3.    -245.       2.      94745       399
            920211 220604.61     268.       -3.    -245.       2.      94745       399
            920211 220612.01     208.       -3.    -245.       2.      94745       399
            920211 220618.41     268.       -3.    -245.       2.      94745       399
            920211 220624.64     268.       -3.    -245.       2.      94745       399
            920211 220632.12     268.       -3.    -245.       2.      94745       399
            920211 220639.87     268.       -3.    -245.       2.      94745       399
            920211 220646.18     208.       -3.    -245.       2.      94745       399
            920211 220652.89     268.       -3.    -246.       2.      94745       399
            920211 220700.56     268.       -3.    -246.       2.      94745       399

 87947      62.24    112.94    -.0030  68 097   0    299.03    920211
            920210 045915.51     622.     -335.    -120.       5.      15390       398
            920211 195236.22     756.     -417.    2419.       5.      19111       396

 87980      99.68    105.37    -.0000  75 052   0    265.16    920210
            920208 132444.34     598.      -21.    -476.     -15.      88079       398
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  SAT        INC   PERIOD      DRAG  INTL DESIG     R.A.     EPOCH
             DATE      TIME     ALT         ΔU        ΔV        ΔW      TAG   SENSOR


88010      69.40    727.21    .0032  00 000    0    97.10    911212
           920211 141657.85   16919.      -503.    -2884.       29.    89505      221
           920211 141742.97   16858.      -501.    -2902.      -26.    89505      221

88025      26.88    523.34   -.0024  67 001    0   107.20    920125
           920122 075031.28     786.      -562.    -2441.       40.    88066      398

88028      17.02    300.80    .0017  00 000    0   354.12    920311
           920205 025953.06     770.      -430.      321.      -25.    15390      398
           920211 090056.60    4638.       648.     3878.      -36.    89832      232
           920211 090126.29    4562.       663.     3781.      -23.    89832      232
           920211 090146.96    4508.       674.     3713.      -14.    89832      232
           920211 090212.96    4441.       686.     3528.       -2.    89832      232

88032       3.46    697.43   -.0008  00 000    0   211.01    911231
           920131 233733.43    1217.      -144.      345.       -6.    88032      398
           920131 233827.41    1125.      -139.      352.       -5.    88032      398
           920131 233859.01    1074.      -135.      355.       -4.    88032      398
           920131 233930.20    1024.      -132.      358.       -3.    88032      398
           920131 234001.14     976.      -130.      362.       -3.    88032      398
           920131 234032.22     930.      -126.      365.       -1.    88032      398
           920131 234103.31     886.      -122.      369.        0.    88032      398
           920131 234134.18     841.      -120.      371.       -1.    88032      398
           920131 234207.02     799.      -115.      375.        1.    88032      398
           920131 234240.62     756.      -111.      379.        2.    88032      398
           920131 234314.37     717.      -105.      382.        3.    88032      398
           920131 234351.53     677.      -100.      386.        4.    88032      398

88033      27.54    494.50   -.0245  67 001    0   306.68    920207
           920211 103545.78   13139.      -158.    -1256.      -39.    89832      231
           920211 103614.94   13161.      -157.    -1258.      -31.    89832      231
           920211 103641.84   13181.      -155.    -1256.      -22.    89832      231
           920211 103708.06   13201.      -154.    -1255.      -14.    89832      231
           920211 103754.13   13235.      -152.    -1256.       -1.    89832      231
           920211 103822.07   13256.      -150.    -3253.        9.    89832      231
           920211 103934.11   13309.      -147.    -1252.       31.    89832      231
           920211 103954.72   13325.      -145.    -1250.       38.    89832      231
           920211 173019.24    8808.      -792.     6117.      -40.    90000      241
           920211 173159.75    6933.      -752.     6027.      -12.    90001      241
           920211 173236.93    8680.      -748.     6014.        7.    90001      241
           920211 173319.96    9033.      -743.     5998.       31.    90001      241
           920211 173345.84    9065.      -740.     5988.       45.    90001      241
           920211 173350.45    9072.      -716.     5944.       10.    90002      242
           920211 173433.40    9125.      -712.     5930.       34.    90002      242

88034      03.55    691.66   -.0134  76 006    0   247.55    920201
           920211 025459.73    1129.      -131.     1869.       14.    90198      383

88035      67.66    726.42    .0030  79 058    0    99.15    911211
           920211 075122.26   10880.       166.    -5464.       18.    89376      232
           920211 075144.00   10834.       104.    -8482.       16.    89376      232
           920211 075205.23   10809.       163.    -5500.       13.    89376      232
           920211 075228.91   10781.       161.    -5519.       11.    89376      232

88045       8.12    802.89   -.0030  84 081    0   358.32    920211
           920201 003122.15     590.      -740.    -2492.       46.    88788      398

88048      23.17    623.13   -.0070  00 000    0   340.65    920120
           920127 004924.94     277.         9.     -195.       14.    88048      398
           920127 004952.17     261.         7.     -196.       13.    88048      398
           920127 005004.26     255.         6.     -196.       12.    88048      398
           920127 005015.94     249.         5.     -196.       11.    88048      398
           920127 005028.42     244.         4.     -196.       10.    88048      398
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SAT         INC    PERIOD       DRAG  INTL DESIG     R.A.     EPOCH
            DATE       TIME      ALT         ΔU        ΔV        ΔW        TAG    SENSOR


            920127 005041.25     239.        3.      -196.        9.    88048       398
            920127 005053.62     235.        2.      -196.        9.    88048       398
            920127 005108.01     230.        1.      -196.        6.    88048       398
            920127 005122.98     226.       -0.      -196.        7.    88048       398
            920127 005140.99     223.       -1.      -197.        5.    88048       398
            920130 013501.19     220.      -27.      -361.       -3.    88048       398
            920130 013529.74     224.      -33.      -360.       -3.    88048       398
            920130 013539.88     226.      -34.      -360.       -4.    88048       398
            920130 013549.80     228.      -36.      -359.       -4.    88048       398
            920130 013600.29     231.      -38.      -359.       -5.    88048       398
            920130 013613.72     236.      -40.      -359.       -6.    88048       398

88056       26.92    553.05    .0020  00 000    0    83.79    920107
            920124 052920.50     515.     -693.     -1868.      -24.    12102       385

88057       26.69    271.39   -.0304  00 000    0   215.04    920210
            920206 150321.55    1264.     -610.      1536.      -10.    68079       398

88061       20.52    714.41   -.0003  00 000    0   341.52    920105
            920211 041108.28     402.    -1179.       -70.      -37.    87153       399

88065       10.28    265.95   -.0179  00 000    0   104.93    920111
            920211 112934.68     846.      143.      1807.      -15.    94718       399

88066       26.92    433.66   -.0201  88 012    0     5.12    920121
            920122 075031.28     786.        6.       -13.      -11.    68066       398

88067       26.03    523.75   -.0066  67 001    0   313.39    920108
            920211 173345.84    2383.      380.     -3670.      -09.    90001       241
            920211 173350.45    2404.      361.     -3717.      -45.    90002       242
            920211 173433.40    2591.      252.     -4059.      -10.    90002       242
            920211 173502.61    2717.      167.     -4289.       14.    90002       242
            920211 173530.30    2836.       77.     -4505.       37.    90002       242

88072       23.93    291.27   -.1030  67 001    0   135.22    920116
            920202 124621.80     281.       50.      -524.        2.    88072       398
            920202 124649.58     257.       42.      -527.        3.    88072       398
            920202 124701.60     247.       39.      -529.        3.    88072       398
            920202 124713.34     237.       36.      -530.        3.    88072       398
            920202 124725.05     229.       33.      -531.        3.    88072       398
            920202 124736.96     220.       29.      -532.        3.    88072       398
            920202 124748.97     211.       26.      -533.        4.    88072       398
            920202 124801.19     203.       22.      -534.        4.    88072       398
            920202 124813.18     195.       19.      -535.        4.    88072       398
            920202 124825.76     187.       15.      -536.        4.    88072       398
            920202 124839.21     179.       11.      -536.        4.    88072       398
            920202 124852.63     171.        7.      -537.        4.    88072       398
            920211 173652.59    5754.      -60.     -2472.       27.    90003       241
            920211 173725.84    5722.      -61.     -2513.       16.    90003       241
            920211 173743.47    5705.      -62.     -2535.       10.    89417       242
            920211 173801.52    5687.      -63.     -2558.        4.    90003       241
            920211 173812.63    5677.      -63.     -2572.        0.    89417       242
            920211 173841.65    5648.      -65.     -2608.       -9.    89417       242
            920211 173911.53    5620.      -66.     -2646.      -19.    89417       242

88074       60.65    714.08   -.0023  00 000    0   120.94    920116
            920211 175401.07   21374.     -121.     -3929.       22.    89416       242

88075       20.70    506.33   -.0217  67 001    0   348.77    920108
            920210 235311.23     607.       72.       750.        1.    88075       399
            920210 235357.48     667.       89.       743.        3.    88075       399
            920210 235456.53     751.      110.       734.        1.    88075       399
            920210 235556.63     942.      130.       724.        0.    88075       399
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SAT        INC    PERIOD       DRAG  INTL DESIG     R.A.     EPOCH
           DATE       TIME      ALT          ΔU       ΔV        ΔW       TAG   SENSOR


         920210 235657.12       939.       149.      712.        0.    88075      399
         920211 085933.98      4628.       973.     2575.       45.    90000      951
         920211 085949.03      4658.      -969.     2670.       47.    90000      951
         920211 090003.68      4687.      -965.     2665.       50.    90000      951
         920210 235354.29       156.      -502.     1031.      -31.    94677      399
         920210 235400.74       157.      -509.     1035.      -24.    94677      399
         920210 235407.22       158.      -515.     1038.      -16.    94677      399
         920210 235413.49       159.      -522.     1042.       -8.    94677      399
         920210 235419.75       161.      -528.     1046.       -1.    94677      399
         920210 235426.21       162.      -535.     1051.        7.    94677      399
         920210 235432.50       164.      -542.     1055.       14.    94677      399
         920210 235439.16       166.      -549.     1059.       22.    94677      399
         920210 235445.69       167.      -556.     1064.       30.    94677      399
         920210 235452.46       169.      -563.     1068.       38.    94677      399

88076      8.53    562.62    -.0053   00 000    0    190.75   920118
         920119 172158.36      2079.      1123.     2573.       44.    11718      398
         920211 085725.14      1272.       175.     -441.       11.    94711      398
         920211 085821.51      1168.       167.     -451.       10.    94711      399
         920211 085836.99      1141.       165.     -455.       10.    94711      399
         920211 085854.15      1111.       162.     -457.       10.    94711      399
         920211 085915.18      1074.       159.     -461.        9.    94711      399

88079     27.00    309.94    -.0067   00 000    0    185.20   920112
         920204 110819.68       178.      -177.     -924.        3.    88079      398
         920204 110844.96       179.      -188.     -921.        2.    88079      398
         920204 110903.01       182.      -195.     -618.        2.    88079      398
         920204 110920.81       185.      -202.     -915.        2.    88079      398
         920204 110938.64       169.      -209.     -912.        2.    88079      398
         920204 110956.35       195.      -215.     -908.        2.    88079      398
         920204 111014.06       200.      -223.     -905.        2.    88079      398
         920204 111031.90       207.      -233.     -901.        2.    88079      398
         920204 111049.97       214.      -236.     -898.        2.    88079      398
         920204 111107.90       223.      -243.     -894.        2.    88079      398
         920204 111126.11       232.      -249.     -890.        2.    88079      398
         920204 111144.84       242.      -255.     -885.        2.    88079      398
         920205 130417.49       403.      -349.     -903.        1.    88079      398
         920205 130509.50       459.      -361.     -887.        0.    88079      398
         920205 130558.03       515.      -370.     -872.        0.    88079      398
         920205 130650.07       580.      -379.     -856.       -0.    88079      398
         920205 130741.94       649.      -386.     -840.       -1.    88079      398
         920205 183534.10      2533.      -401.     -594.       -5.    88079      398
         920206 145927.72       876.      -444.     -856.       -1.    88079      398
         920206 150018.37       956.      -447.     -340.       -2.    88079      398
         920206 150119.14      1055.      -450.     -822.       -2.    88079      398
         920206 150219.99      1158.      -452.     -804.       -2.    88079      398
         920206 150321.55      1264.      -453.     -786.       -2.    88079      398
         920207 112808.80       203.      -335.    -1126.        2.    88079      398
         920207 113001.43       261.      -379.    -1092.        1.    88079      398
         920207 165639.68      1709.      -492.     -776.       -3.    88079      398
         920208 132305.70       476.      -493.    -1085.       -0.    88079      398
         920208 132444.34       598.      -510.    -1047.       -0.    88079      398
         920208 132630.42       746.      -522.    -1007.       -1.    88079      398
         920209 095244.27       186.      -293.    -1340.        3.    88079      398
         920209 095357.29       175.      -339.    -1324.        2.    88079      398
         920209 151846.06      1040.      -583.    -1004.       -3.    88079      398
         920210 114604.06       211.      -485.    -1354.        1.    88079      398
         920210 114827.40       299.      -541.    -1297.        1.    88079      398
         920211 080906.00       834.       323.     -296.       -2.    94236      399
         920211 134139.59       557.      -655.    -1263.       -1.    88079      398
         920211 134324.21       697.      -667.    -1215.       -2.    88079      398
         920211 134515.73       863.      -674.    -1167.       -3.    88079      398
         920211 134139.59       557.      -655.    -1263.       -1.    88079      399
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SAT         INC   PERIOD      DRAG  INTL DESIG     R.A.      EPOCH
             DATE      TIME      ALT         ΔU       ΔV        ΔW        TAG    SENSOR


             920211 134324.21     697.      -667.    -1215.       -2.     88079       399
             920211 134515.73     863.      -674.    -1167.       -3.     88079       399
             920211 131840.00     791.      -576.     2550.        8.     90233       383
             920211 131850.04     809.      -543.     2552.      -18.     90233       383

88082        68.91    713.17    0.0000  76 105    0     300.97     920105
             920211 094537.73    2225.       392.    -3505.       14.     89832       233
             920211 094615.92    2357.       316.    -3801.      -32.     89832       233

88083        25.60    711.74    -.0251  00 000    0     336.16     920104
             920210 235311.41     607.       109.      938.       -1.     88075       399
             920210 235357.48     667.       158.      916.       15.     88075       399
             920210 235456.53     751.       219.      883.       34.     88075       399
             920211 120844.16    3058.       143.     -408.       39.     83999       222
             920211 121000.75    3276.       178.     -569.        2.     83999       222
             920211 121038.61    3384.       194.     -649.      -17.     83999       222
             920210 235329.99     353.      -439.     1178.      -31.     94677       399
             920210 235354.29     156.      -447.     1180.        6.     94677       399
             920210 235400.74     157.      -449.     1181.       16.     94877       399
             920210 235407.22     158.      -451.     1181.       26.     94677       399
             920210 235413.49     159.      -453.     1182.       36.     94677       399
             920210 235419.75     161.      -455.     1183.       45.     94677       399

88086        18.04    384.11    -.5044  00 000    0     109.72     920201
             920211 035908.09     700.      -558.     1334.       42.     90201       382
             920211 035918.13     685.      -556.     1334.       30.     90201       382
             920211 035948.37     644.      -543.     1335.       -3.     90201       382

88102        26.95    409.64    -.0226  86 016    0      35.99     920112
             920113 055509.31     706.       -32.      661.      -37.     12102       399

88108         7.02   1422.17    0.0000  00 000    0      64.88     920210
             920210 211716.37   19162.         4.       29.        8.     89298       221
             920210 211804.49   19162.         4.       30.        8.     89298       221
             920210 211850.51   19162.         4.       32.        8.     89298       221
             920210 211939.45   19163.         5.       39.        8.     89298       221
             920211 185826.02   19171.        -0.       44.        9.     89298       243
             920211 185858.68   19171.        -0.       44.        9.     89298       243
             920211 185926.40   19171.        -0.       44.        9.     89298       243
             920211 185956.86   19171.        -0.       44.        9.     89298       243
             920210 224108.97   19163.       -68.     1884.       14.     89412       242
             920210 224146.21   19163.       -67.     1883.        7.     89412       242
             920210 224225.01   19163.       -67.     1882.       -0.     89412       242
             920210 224301.19   19163.       -67.     1881.       -7.     89412       242
             920210 232656.94   19159.       -33.     1384.       44.     89413       242
             920210 232721.32   19159.       -33.     1383.       42.     89413       242
             920210 232742.25   19359.       -33.     1383.       41.     89413       242
             920210 232803.48   19159.       -33.     1382.       40.     89413       242

88111         7.96   1435.11    0.0000  00 000    0      58.15     920209
             920210 224108.97   19406.      -357.     4411.      -13.     89412       242
             920210 224146.21   19407.      -356.     4411.      -19.     89412       242
             920210 224225.01   19407.      -356.     4410.      -25.     89412       242
             920210 224301.19   19407.      -356.     4410.      -30.     89412       242
             920211 172857.63   19296.      -275.     3832.      -14.     90000       241
             920211 172923.67   19297.      -275.     3832.      -14.     90000       241
             920211 172952.42   19297.      -275.     3832.      -14.     90000       241
             920211 173019.24   19297.      -275.     3832.      -14.     90000       241
             920211 173159.75   19296.      -253.     3694.       17.     90001       241
             920211 173236.93   19296.      -252.     3691.       17.     90001       241
             920211 173319.96   19296.      -251.     3637.       13.     90001       241
             920211 173345.84   19296.      -251.     3685.       19.     90001       241
             920211 173350.45   19297.      -230.     3558.        4.     90002       242
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SAT        INC    PERIOD      DRAG  INTL DESIG     R.A.     EPOCH
            DATE        TIME      ALT         ΔU       ΔV        ΔW       TAG   SENSOR


           920211 173433.40    19297.      -230.     3558.        5.     90002      242
           920211 173502.61    19297.      -230.     3557.        6.     90002      242
           920211 173530.30    19297.      -230.     3557.        6.     90002      242
           920211 173616.76    19297.      -230.     3556.        7.     90003      241
           920211 173652.59    19297.      -230.     3556.        7.     90003      241
           920211 173725.84    19297.      -230.     3556.        8.     90003      241
           920211 173743.47    19297.      -230.     3556.        6.     89417      242
           920211 173801.52    19297.      -230.     3555.        8.     90003      241
           920211 173812.63    19297.      -233.     3556.        8.     89417      242
           920211 173841.65    19297.      -230.     3555.        9.     89417      242
           920211 173911.53    19298.      -230.     3555.       10.     89417      242
           920211 174036.02    19298.      -229.     3554.       31.     89417      242
           920211 174100.85    19298.      -229.     3554.       11.     89417      242
           920211 174117.68    19299.      -275.     3834.       -9.     89415      241
           920211 174127.77    19298.      -229.     3554.       12.     89417      242
           920211 174144.50    19299.      -275.     3834.       -9.     89415      241
           920211 174154.62    19298.      -229.     3553.       12.     89417      242
           920211 174209.95    19299.      -275.     3834.       -9.     89415      241
           920211 174235.53    19299.      -275.     3834.       -9.     89415      241
           920211 174250.79    19298.      -229.     3553.       13.     89417      242
           920211 174354.95    19299.      -275.     3834.       -3.     89415      241
           920211 174407.61    19296.      -229.     3552.       14.     89417      242
           920211 174419.76    19299.      -275.     3834.       -8.     89415      241
           920211 174433.94    19298.      -229.     3552.       15.     89417      242
           920211 174443.66    19299.      -275.     3834.       -8.     89415      241
           920211 174459.73    19299.      -229.     3552.       15.     89417      242
           920211 174508.59    19299.      -275.     3835.       -8.     89415      241
           920211 174525.20    19299.      -229.     3551.       16.     89417      242
           920211 174633.88    19300.      -275.     3835.       -7.     89415      241
           920211 174634.25    19299.      -229.     3551.       17.     89417      242
           920211 174701.55    19300.      -275.     3835.       -7.     89415      241
           920211 174711.38    19299.      -229.     3550.       17.     89417      242
           920211 174726.68    19300.      -275.     3835.       -7.     89415      241
           920211 174736.50    19299.      -229.     3550.       18.     89417      242
           920211 174751.79    19300.      -275.     3835.       -7.     89415      241
           920211 174808.02    19299.      -229.     3550.       18.     89417      242
           920211 174913.11    19300.      -275.     3835.       -6.     89415      241
           920211 174940.71    19300.      -275.     3835.       -6.     89415      241
           920211 175001.63    19299.      -238.     3602.       41.     89416      242
           920211 175006.70    19300.      -275.     3835.       -5.     89415      241
           920211 175039.33    39301.      -275.     3835.       -5.     89415      241
           920211 175040.69    19299.      -238.     3599.       42.     89416      242
           920211 175147.94    19299.      -237.     3594.       43.     89416      242
           920211 175257.00    19299.      -236.     3588.       44.     89416      242
           920211 175401.07    19299.      -235.     3582.       46.     89416      242
           920211 175544.14    19299.      -234.     3574.       48.     89416      242
           920211 175610.24    19300.      -233.     3571.       49.     89416      242
           920211 175641.24    19300.      -233.     3569.       49.     89416      242
           920211 175726.50    19301.      -228.     3544.       27.     90004      241
           920211 175758.10    19301.      -228.     3544.       27.     90004      241
           920211 175828.40    19301.      -226.     3544.       28.     90004      241
           920211 175859.75    19301.      -228.     3544.       28.     90004      241

88112      18.38  1407.40   0.0000  00 000    0     62.54    920209
           920211 141612.28    18976.          1.       0.       14.     89505      221
           920211 141657.85    18967.          1.      -0.       14.     89505      221
           920211 141742.97    18957.          1.       0.       13.     89505      221
           920211 141832.10    18947.          1.       1.       13.     89505      221

88114      11.34  1435.37   0.0000  00 000    0     47.28    920210
           920211 144608.40    19362.          0.     -21.       10.     89785      221
           920211 144657.50    19362.          0.     -21.       10.     89785      221
           920211 144717.19    19362.          0.     -21.       10.     89785      221
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  SAT        INC    PERIOD       DRAG  INTL DESIG     R.A.      EPOCH
             DATE        TIME     ALT          ΔU       ΔV        ΔW         TAG   SENSOR


           920211 144736.67   19362.          0.      -21.       10.      89785      221

 88117     16.25   1695.54   0.0000  00 000   0     37.21    920210
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           920211 064813.17   21608.          0.       -4.       17.      89871      231
           920211 064928.93   23608.          0.       -5.       18.      89871      231
           920211 064956.54   21607.          0.       -5.       18.      89871      231
           920211 075734.75   21575.          0.       -5.       13.      89871      231
           920211 075840.02   21574.          0.       -4.       13.      89871      231
           920211 075859.00   21574.          0.       -5.       13.      89871      231
           920211 075921.67   21574.          0.       -5.       13.      89871      231

 88119     65.32    335.21   -.0750  85 118   0     22.90    920206
           920211 130618.89    3786.        322.     -399.      -29.      80108      334
           920211 130702.79    3712.        325.     -408.      -31.      80108      334
           920211 130724.53    3674.        326.     -409.      -30.      80108      334
           920211 130746.10    3638.        328.     -414.      -33.      80108      334
           920211 130807.52    3599.        327.     -415.      -29.      80108      334
           920211 130828.77    3563.        329.     -421.      -30.      80108      334
           920211 130849.87    3527.        330.     -423.      -30.      80108      334
           920211 130910.81    3490.        330.     -426.      -29.      80108      334
           920211 130931.59    3452.        330.     -432.      -27.      80108      334
           920211 130952.22    3420.        334.     -436.      -34.      80108      334
           920211 131002.48    3400.        333.     -440.      -30.      80108      334
           920211 131022.89    3363.        332.     -444.      -27.      80108      334
           920211 131043.15    3329.        335.     -447.      -30.      80108      334
           920211 131103.26    3294.        336.     -450.      -31.      80108      334
           920211 131123.23    3258.        335.     -454.      -29.      80108      334
           920211 131150.48    3211.        338.     -458.      -31.      80108      334
           920211 131209.80    3176.        338.     -462.      -30.      80108      334
           920211 131228.98    3144.        340.     -466.      -32.      80108      334
           920211 131248.03    3110.        340.     -474.      -32.      80108      334
           920211 131313.23    3063.        340.     -476.      -29.      80108      334
           920211 131331.98    3030.        341.     -481.      -30.      80108      334
           920211 131402.95    2974.        340.     -489.      -28.      80108      334
           920211 131421.37    2941.        341.     -492.      -28.      80108      334
           920211 131439.67    2908.        341.     -491.      -28.      80108      334
           920211 131457.86    2877.        342.     -499.      -29.      80108      334
           920211 131515.93    2845.        344.     -501.      -30.      80108      334
           920211 131539.84    2802.        343.     -507.      -29.      80108      334
           920211 131922.29    2401.        343.     -560.      -27.      80108      334
           920211 131942.00    2367.        343.     -566.      -28.      80108      334
           920211 132001.59    2331.        342.     -572.      -26.      80108      334

 88120      7.47    421.27   -.0465  00 000   0    148.79    920120
           920207 071228.77    7617.       -914.     1359.       46.      21538      334
           920207 071300.91    7676.       -813.     1365.        8.      21538      334
           920207 071311.24    7696.       -781.     1370.       -6.      21538      334
           920207 071321.07    7713.       -749.     13631      -13.      21538      334
           920207 071330.93    7730.       -719.     1359.      -28.      21538      334
           920207 071340.81    7748.       -689.     1363.      -46.      21538      334
           920211 173319.96    1279.        544.    -1468.      -42.      90001      241
           920211 173345.84    1360.        606.    -1631.      -26.      90001      241
           920211 173350.45    1375.        614.    -1670.      -24.      90002      242
           920211 173433.40    1522.       -707.    -1959.        5.      90002      242
           920211 173502.61    1627.        760.    -2167.       25.      90002      242
           920211 173530.30    1731.        803.    -2371.       45.      90002      242
           920211 104534.61     525.         59.     1190.        1.      94257      399
           920211 104627.89     599.         94.     1177.        1.      94257      399
           920211 104727.00     687.        132.     1161.        1.      94257      399
           920211 104827.12     782.        166.     1142.        1.      94257      399
           920211 104927.81     883.        200.     1121.        1.      94257      399
           920211 105034.13     998.        232.     1098.        0.      94257      399
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SAT         INC    PERIOD      DRAG  INTL DESIG     R.A.     EPOCH
            DATE        TIME    ALT          ΔU       ΔV       ΔW       TAG   SENSOR


88127      27.73    547.10   -.0023  00 000   0     8.50    920210
          920121 012425.76    1479.      -143.    -951.      -35.    88893      398

88446       7.15    466.94   -.0515  88 063   0   190.50    911231
          920211 135416.12     671.        99.    1402.       1.    94637      399
          920211 135503.63     747.       136.    1386.       0.    94637      399
          920211 135603.62     849.       181.    1363.       0.    94637      399
          920211 135702.68     954.       222.    1340.       0.    94637      399
          920211 135803.88    1067.       262.    1314.       1.    94637      399

88454      67.60    735.51   0.0000  00 000   0    75.35    920201
          920211 043121.74   17896.      -532.   -6116.      29.     2865      369

88540      16.82    702.36   -.0622  00 000   0   332.05    920212
          920211 011248.91     385.     -1343.    1073.      -47.    94679      399

88629      18.55    698.71   -.0045  00 000   0   189.66    920205
          920211 123620.44    3330.       -70.     -77.      12.    88629      334
          920211 123643.86    3381.       -71.     -77.       8.    88629      334
          920211 123751.07    3531.       -71.     -75.       8.    88629      334
          920211 123849.23    3662.       -69.     -75.      12.    88629      334
          920211 124021.77    3866.       -69.     -78.       9.    88629      334

88632      52.27    324.35   -.0666  83 127   0   291.29    920231
          920211 084039.55    1525.       635.    1343.      -11.    89832      232
          920211 084103.66    1479.       591.    1223.      20.    89832      232

88699      17.29    573.93   -.0499  90 065   0   163.40    920211
          920211 081020.79    1849.      -156.   -1156.      43.    90216      382

88732      62.60    277.33   -.0440  87 036   0   283.69    920201
          920211 003625.05     644.        55.    1546.      36.    90000      329

88737       7.19    458.64   -.0391  88 063   0   132.19    911230
          920211 173530.30    3861.      -853.    6751.      32.    90002      242
          920211 173616.76    3681.      -514.    6396.       5.    90003      241
          920211 173652.59    3544.      -284.    6117.      -16.    90003      241
          920211 173725.84    3418.       -94.    5845.      -35.    90003      241
          920211 173743.47    3351.        -2.    5701.      -45.    89417      242

88764      27.03    688.10   -.0040  00 000   0   293.97    920206
          920208 211808.34     299.      -402.    -439.      -16.    19994      399

88769      17.59    616.92   -.0192  90 065   0   178.87    920201
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          920211 124605.37    2962.       241.     287.       6.    88769      334
          920211 125025.62    3556.       240.     254.       5.    88769      334
          920211 125124.41    3688.       238.     251.       8.    88769      334
          920211 125157.84    3761.       235.     246.      -3.    88769      334

88788       8.58    582.76   -.0195  85 056   0     4.99    920116
          920129 235105.84    1441.       -24.      55.      -3.    88788      398
          920129 235203.40    1325.       -24.      55.      -3.    88788      398
          920129 235245.77    1242.       -23.      56.      -3.    88788      398
          920129 235327.88    1162.       -22.      55.      -2.    88788      398
          920129 235410.28    1081.       -22.      57.      -2.    88788      398
          920129 235511.74     970.       -21.      59.      -2.    88788      398
          920129 235554.67     894.       -20.      60.      -2.    88788      398
          920129 235638.11     822.       -19.      60.      -2.    88788      398
          920129 235722.03     751.       -10.      61.      -1.    88788      398
          920129 235803.60     683.       -22.      72.      -6.    88788      398
          920131 052028.33     445.        17.      90.       2.    88788      398
          920201 003122.15     590.       -31.     112.      -1.    88788      398
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  SAT      INC   PERIOD     DRAG  INTL DESIG    R.A.     EPOCH
          DATE       TIME    ALT          ΔU      ΔV        ΔW       TAG    SENSOR


         920211 223247.69    623.     -203.     -582.      29.     90462      385
         920211 031726.25   1128.      785.      915.     -26.     94567      399
         920211 223258.96    635.     -173.     -584.      17.     94750      399
         920211 223337.13    693.      -56.     -589.      -7.     94750      399
         920211 223404.43    735.       26.     -599.     -25.     94750      399
         920211 223435.15    788.      120.     -618.     -44.     94750      399

88794    88.98   166.31    -.0006  66 077   0   269.78   920211
         920211 064813.17   2771.       -4.       65.     -23.     89871      231
         920211 064928.93   2800.       13.     -356.       9.     89871      231
         920211 064956.54   2812.       19.     -237.      21.     89871      231

88812    26.59   398.66    -.0376  67 001   0   121.82   911214
         920211 135503.63    747.     -140.     -398.     -30.     94637      399

88838    63.12   287.49    -.0004  00 000   0   135.04   911229
         920211 092047.21    239.     -265.      468.       1.     89376      232
         920211 092111.34    246.     -256.      374.      -2.     89376      232
         920211 092134.88    204.     -244.      301.      -2.     89376      232
         920211 092159.30    294.     -222.      241.      -1.     89376      232

88847    58.75   734.40    -.0005  00 000   0   160.40   920130
         920211 080706.10   1057.        3.    -1685.      44.     94236      399
         920211 081010.75   1831.     -123.    -3560.     -32.     90216      382

88848    19.97   485.54    -.0097  00 000   0   335.81   911228
         920209 024650.96   1012.     -437.      200.      11.     15390      398
         920211 031524.51    899.     -968.     1177.      36.     94567      399
         920211 031625.58   1011.     -756.     1276.      -2.     94567      399
         920211 031726.20   1128.     -539.     1356.     -40.     94567      399

88850     5.98   661.51    -.0015  00 000   0    77.90   920131
         920211 025439.64   1096.        3.       54.      -7.     90198      383
         920211 025459.73   1129.        5.       56.      -7.     90198      383
         920211 025509.77   1146.        5.       55.      -7.     90198      383
         920211 025529.86   1180.        6.       56.      -6.     90198      383
         920211 025539.90   1197.        6.       57.      -7.     90198      383

88856    62.94   158.08    -.0147  00 000   0   227.35   920211
         920211 000143.45   2177.       -1.       -5.     -10.     88856      399
         920211 000421.52   2037.        0.       -8.      -3.     88856      399
         920211 133615.76    794.     -406.       55.      13.     94719      399

88868     7.34   604.00    -.0002  84 081   0   326.40   920112
         920211 175709.66   3387.     -189.    -5522.     -33.     89416      242
         920211 175728.50   3469.     -286.    -5671.     -24.     90004      241
         920211 175758.10   3595.     -440.    -5897.      -4.     90004      241
         920211 175820.40   3723.     -807.    -6124.      17.     90004      241
         920211 175847.64   3804.     -715.    -6253.      36.     89416      242
         920211 175859.75   3855.     -787.    -6353.      39.     90004      241
         920211 072951.39   1288.    -1097.     3055.      40.     90233      388

88871    27.19   281.68    -.0030  00 000   0   203.83   911230
         920211 165814.93   2625.       40.     1441.     -21.      8547      334
         920211 165853.48   2550.      -95.     1410.      21.      8547      334

88879    63.21   718.07     .0039  90 101   0     4.74   911217
         920211 100911.49   3611.      229.    -5243.     -30.     89813      232
         920211 100943.36   3658.      155.    -5421.      -3.     89813      232

88884    24.76   617.94    -.1068  84 093   0    76.57   920128
         920206 143035.10   2210.    -1157.     4985.     -19.     15390      398
         920206 143201.50   2359.     -879.     4930.     -29.     15390      398
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 SAT        INC   PERIOD      DRAG  INTL DESIG     R.A.     EPOCH
            DATE       TIME    ALT          ΔU       ΔV       ΔW        TAG    SENSOR


          920206 143330.85    2511.      -633.    4857.     -43.     15390       398
          920204 110819.68     178.      -464.    -125.      23.     88079       398

88888      5.92    663.22   -.0026  00 000   0   129.28   911210
          920210 224923.21   18734.     -1231.    8192.     -13.     89416       242
          920210 224954.97   18751.     -1239.    8217.     -17.     89416       242
          920210 225040.46   18775.     -1249.    8254.     -24.     89416       242
          920210 225117.77   18795.     -1257.    6284.     -30.     89416       242
          920210 225302.73   18849.     -1281.    8368.     -46.     89417       242

88892     26.56    494.39   -.0052  67 001   0   245.98   920109
          920126 220010.21    1245.      -186.     347.       0.     88892       398
          920126 220133.89    1093.      -181.     360.       1.     88892       398
          920126 220347.36     869.      -169.     381.       2.     88892       398
          920128 232902.17     604.      -180.     408.       2.     88892       398
          920128 233002.62     808.      -181.     416.       2.     88892       398
          920128 233141.60     664.      -169.     436.       3.     88892       398
          920206 213722.87     995.      -417.     773.       0.     88892       398
          920206 213800.26     632.      -413.     785.       0.     88892       398

88893     26.85    254.19   -.0472  00 000   0   268.52   920118
          920119 025118.25    1248.        18.     -37.       1.     88893       398
          920119 025330.32    1035.        16.     -40.       1.     88893       398
          920119 025559.54     808.        12.     -43.       1.     88893       398
          920121 012227.11    1680.        57.    -106.      -1.     88893       398
          920121 012316.83    1595.        56.    -109.       1.     88893       398
          920121 012425.76    1479.        55.    -113.       1.     88893       398
          920123 042117.61     695.        70.    -275.       1.     88893       398
          920123 042156.37     642.        65.    -279.       0.     88893       398
          920123 042305.72     552.        58.    -283.       1.     88893       398
          920124 012108.74    1653.       126.    -272.      -1.     88893       398
          920124 012141.64    1597.       125.    -276.      -1.     88893       398
          920124 012225.80    1522.       123.    -280.      -0.     88893       398
          920127 011746.77    1619.       209.    -508.      -2.     88893       398
          920127 011800.41    1596.       203.    -511.      -1.     88893       398
          920127 011818.20    1566.       207.    -514.      -1.     88893       398

88895     27.50    537.69    .0003  67 001   0   315.86   920209
          920211 185858.68    1474.         5.     -31.     -46.     89298       243
          920211 185920.40    1516.        -6.    -141.     -34.     89298       243
          920211 185956.86    1568.       -15.    -261.     -20.     89298       243

88917      8.01    546.84   -.0556  00 000   0   305.41   920128
          920205 025353.20    1327.      -722.      87.      29.     15390       398
          920202 020649.86    2318.      -410.    -515.      -4.     88917       399
          920202 020730.47    2406.      -409.    -505.      -5.     88917       398
          920211 223247.69     623.        64.     302.       2.     90462       385
          920211 223258.96     635.        61.     298.      -8.     94750       399
          920211 223337.13     693.        65.     296.      -3.     94750       399
          920211 223404.43     735.        67.     264.      -3.     94750       399
          920211 223435.15     788.        72.     291.      -3.     94750       399
          920211 223510.96     847.        75.     289.      -4.     94750       399

88919     26.96    606.97   -.0901  00 000   0   272.93   920116
          920211 220531.05     268.     -1047.     549.      19.     94745       399

88922     56.59    277.06   -.0296  00 000   0   128.98   920211
          920211 044449.29     802.       275.   -1247.      22.     94695       399

88924     24.39    329.13   -.0723  67 001   0   336.83   911211
          920205 025553.06    1132.       236.   -2567.      -3.     15390       398

88928     66.50    715.35    .0032  00 000   0   191.57   911225
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  SAT        INC   PERIOD      DRAG  INTL DESIG     R.A.     EPOCH
             DATE       TIME    ALT         ΔU       ΔV        ΔW        TAG   SENSOR


           920211 050435.26   10324.       277.     -711.       -3.    21854       369

88931      26.42    465.40   -.0486  67 001   0    244.49    920202
           920211 201906.84     201.       -17.      572.      -0.    90249       383
           920211 201926.93     210.       -10.      572.      -0.    90249       383
           920211 201937.00     215.        -7.      572.      -0.    90249       383
           920211 201947.02     220.        -4.      571.      -0.    90249       383
           920211 201957.06     225.        -0.      571.       0.    90249       383
           920211 202017.15     237.         5.      570.       0.    90249       383
           920211 202027.19     244.        10.      569.      -1.    90249       383
           920211 202037.24     250.        13.      569.       1.    90249       383
           920211 202047.28     257.        17.      568.       1.    90249       383
           920211 202057.32     264.        20.      567.       1.    90249       383

88933      26.32    289.06   -.2307  00 000   0     78.05    920105
           920211 100816.72    2057.       729.    -1319.      -14.    89813       232

88934      47.52    262.67   -.0701  00 000   0     61.49    911210
           920210 200459.89    3919.        -8.     2990.      -11.    82080       222
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APPENDIX D. EVALUATOR RANKINGS

Internally, the expert system only uses the numerical rankings provided by the evaluator for the processing of UCTs. The printout in this enclosure serves as a tool for verification and debugging the performance of the system.

Each line represents a single track. Table VIII explains the meaning of each column of data.

TABLE VIII. CONTENTS OF EVALUATOR PRINTOUT

COLUMN HEADING	CONTENTS
SAT	NAVSPASUR satellite identification number
SNSR	Sensor that produced the track
DATE	Date track was observed in YYMMDD
TIME	Time track was observed in HHMMSS.HH
OBS	Number of observations in the track. A fuzzy variable
U	ΔW error. A fuzzy variable
V	ΔV error. A fuzzy variable
W	ΔW error. A fuzzy variable
W>10	Number of ΔW errors in the track that are greater than ten
FH	The front half, a NAVSPASUR term. If true, indicates that the ranking of the track was adjusted because it came from a sensor assumed to produce only good data
HALO	Halo. If true, indicates that the ranking of the track was adjusted because of its similarity to other tracks assigned to the same satellite
AGE	Age. If true, indicates that the ranking of the track was adjusted because its date is significantly different from that of the satellite's element set
σ	Standard deviation. If true, indicates that the ranking of the track was adjusted because of large variations in the ΔU or the ΔV errors
RANK	The evaluator's ranking of the track
EXPERT	Expert's opinion of the track. YES indicates an attempt was made to fit the track to the orbital catalog

SAT	SNSR	DATE	TIME	OBS	U	V	W	W>10	ID	FH	HALO	AGE	σ	RANK	EXPERT
21854	369	920211	035325.95	100	69	0	91	100	100	T	F	T	F	100	YES
21854	369	920211	050100.73	100	68	0	93	100	100	T	F	T	F	100	YES
21854	369	920211	022437.88	100	81	0	92	100	100	T	F	T	F	100	YES
21538	334	920207	071500.69	0	0	0	31	100	100	T	F	F	F	100	YES
3899	396	920116	052633.12	0	0	0	69	100	100	T	F	F	F	100	YES
21854	404	920211	041331.80	100	68	0	48	70	100	T	F	T	T	100	YES
21855	369	920211	023724.93	100	99	53	69	100	100	T	F	F	F	100	YES
8547	334	920211	165652.54	100	79	35	91	100	100	T	F	F	T	100	YES
17253	334	920114	103256.76	80	75	88	61	80	100	T	F	T	F	100	YES
15758	396	920211	104746.33	40	34	0	96	100	100	T	F	T	F	100	YES
17253	334	920114	105051.82	60	78	90	0	50	100	T	F	T	F	100	YES
15390	398	920205	025047.47	100	93	91	100	100	100	F	F	F	F	100	YES
15390	398	920206	050941.81	0	0	0	100	100	100	F	T	F	F	100	YES
19111	396	920211	195216.51	40	99	95	100	100	100	T	F	T	F	100	YES
87302	396	920122	023430.37	40	21	0	75	100	100	T	F	T	F	100	YES
18955	396	920211	065624.74	40	99	98	11	0	100	T	F	F	F	100	YES
87302	396	920121	021310.78	40	0	0	75	100	100	T	F	T	F	100	YES
87302	396	920124	123825.29	40	86	0	100	100	100	T	F	T	F	100	YES
21855	369	920211	052003.77	100	99	52	73	100	100	T	F	F	F	100	YES
21854	369	920211	030916.93	80	74	0	95	100	100	T	F	T	T	100	YES
10617	396	920211	182910.50	20	99	100	85	100	100	T	F	F	F	100	YES
21854	369	920211	030327.21	100	75	0	94	100	100	T	F	T	F	100	YES
87302	396	920122	120013.03	40	39	0	100	100	100	T	F	T	F	100	YES
14362	396	920211	020456.34	40	96	49	94	100	100	T	F	F	F	100	YES
88769	334	920211	124356.87	80	56	77	68	100	100	T	F	T	F	100	YES
11332	396	920211	091102.01	20	100	100	100	100	100	T	F	F	F	100	YES
88629	334	920211	123620.44	80	87	93	34	60	100	T	F	T	F	100	YES
87302	396	920120	125531.79	40	0	0	96	100	100	T	F	T	F	100	YES
87272	396	920211	194016.37	40	92	98	0	0	100	T	F	F	F	100	YES
13464	396	920211	065548.75	40	97	43	100	100	100	T	F	F	F	100	YES
2865	369	920211	041558.43	100	96	95	0	0	100	T	F	F	F	100	YES
15390	398	920205	120903.59	100	91	89	97	100	100	F	F	F	F	99	YES
15390	398	920204	143150.82	100	95	94	94	100	100	F	F	F	F	99	YES
15390	398	920207	072808.50	100	98	73	97	100	100	F	F	T	F	99	YES
15390	398	920206	094834.08	100	91	81	100	100	100	F	F	T	F	99	YES
15390	398	920206	142622.62	100	86	85	90	100	100	F	F	T	F	99	YES
88892	398	920126	220010.21	40	60	62	92	100	100	F	F	T	F	99	YES
88788	398	920131	052028.33	0	32	0	85	100	100	F	T	F	F	99	YES
15390	398	920208	050436.75	100	81	67	100	100	100	F	F	T	F	99	YES
88893	398	920124	012108.74	40	66	65	95	100	100	F	F	T	F	99	YES
88892	398	920128	232902.17	40	61	56	84	100	100	F	F	T	F	99	YES
15390	398	920209	023657.23	100	67	65	95	100	100	F	F	T	F	99	YES
15390	398	920208	215222.16	100	72	78	75	100	100	F	F	T	F	99	YES
15390	398	920207	120331.15	100	82	77	93	100	100	F	F	T	F	99	YES
88788	398	920129	235105.84	100	96	95	82	100	100	F	F	T	F	99	YES
21692	398	920114	201731.99	100	66	63	95	100	100	F	F	T	F	99	YES
15390	398	920209	072238.54	100	93	52	96	100	100	F	F	T	F	99	YES
88931	383	920211	201906.84	100	98	47	96	100	0	F	F	T	F	99	YES
15390	398	920210	093716.01	100	81	40	91	100	100	F	F	T	F	99	YES
15390	398	920210	045915.51	0	0	0	100	100	100	F	T	F	F	99	YES
88072	398	920202	124621.80	100	93	41	79	100	100	F	F	T	F	99	YES
88075	399	920210	235311.23	80	77	31	91	100	100	F	F	T	F	99	YES
15390	398	920208	094258.60	100	85	65	94	100	100	F	F	T	F	99	YES
20672	398	920201	114236.23	40	86	81	76	100	100	F	F	T	F	99	YES
88048	398	920130	013501.19	100	93	67	72	100	100	F	F	T	F	99	YES
88032	398	920131	233733.43	100	69	54	75	100	100	F	F	T	F	99	YES
15390	398	920209	115754.19	100	70	59	92	100	100	F	F	T	F	99	YES
88079	398	920204	110819.68	100	39	0	86	100	100	F	F	T	F	97	YES
88079	399	920211	080906.00	0	0	0	85	100	0	F	T	F	F	97	YES
18601	399	920211	051519.34	80	71	57	77	100	100	F	F	T	F	97	YES
88893	398	920127	011746.77	40	44	36	91	100	100	F	F	T	F	96	YES
88893	398	920123	042117.61	40	82	65	95	100	100	F	F	T	F	96	YES
88917	399	920211	223258.96	80	87	76	72	100	0	F	F	T	F	95	YES
88917	399	920202	020649.86	0	0	0	69	100	100	F	T	F	F	95	YES

SAT	SNSR	DATE	TIME	OBS	U	V	W	W>10	ID	FH	HALO	AGE	σ	RANK	EXPERT
88917	398	920202	020730.47	0	0	0	62	100	100	F	T	F	F	95	YES
88079	398	920205	130417.49	80	0	0	96	100	100	F	F	T	F	91	YES
88850	383	920211	025439.64	80	99	94	53	100	0	F	F	T	F	91	YES
88048	398	920127	004924.94	100	99	82	35	50	100	F	F	T	F	90	YES
87336	396	920211	095954.57	80	96	29	89	100	0	F	F	T	F	89	YES
88893	398	920119	025118.25	40	96	95	94	100	100	F	F	F	F	89	YES
88893	398	920121	012227.11	40	85	86	94	100	100	F	F	F	F	88	YES
15390	398	920204	220712.12	40	94	95	86	100	100	F	F	F	F	87	YES
87869	399	920211	220531.05	100	99	50	88	100	0	F	F	T	F	85	YES
88120	399	920211	104534.61	100	66	0	94	100	0	F	F	T	F	85	YES
88079	398	920208	132305.70	40	0	0	96	100	100	F	F	T	F	84	YES
21058	399	920211	060621.80	100	100	100	95	100	0	F	F	F	F	84	YES
20947	399	920211	080512.09	100	100	100	95	100	0	F	F	F	F	84	YES
88892	398	920206	213722.87	20	7	18	100	100	100	F	F	T	F	84	YES
87869	396	920211	012726.24	80	98	51	94	100	0	F	F	T	F	84	YES
20171	385	920211	090645.29	100	99	100	92	100	0	F	F	F	F	83	YES
14362	399	920211	124613.90	60	93	35	97	100	100	F	F	F	F	83	YES
19994	399	920205	214636.98	40	0	0	87	100	100	F	F	T	F	82	YES
87376	393	920211	182446.10	80	69	0	97	100	0	F	F	T	F	81	YES
88079	399	920211	134139.59	40	0	0	86	100	100	F	F	T	F	81	YES
20171	385	920211	090347.41	100	99	100	85	100	0	F	F	F	F	81	YES
19994	399	920204	215559.39	40	15	0	85	100	100	F	F	T	F	81	YES
88079	398	920211	134139.59	40	0	0	86	100	100	F	F	T	F	81	YES
20596	385	920211	113638.66	100	95	92	86	100	0	F	F	F	F	81	YES
88446	399	920211	135416.12	80	62	0	96	100	0	F	F	T	F	80	YES
11343	242	920210	225629.64	60	100	100	100	100	0	F	F	F	F	79	NO
19994	399	920201	222215.38	40	85	39	81	100	100	F	F	T	F	79	YES
88079	398	920207	112808.80	20	1	0	90	100	100	F	F	T	F	79	YES
88079	398	920210	114604.06	20	0	0	93	100	100	F	F	T	F	79	YES
88079	398	920209	095244.27	20	12	0	83	100	100	F	F	T	F	78	YES
87373	396	920211	061147.69	60	89	0	92	100	0	F	F	T	F	77	YES
19994	399	920203	220516.73	40	49	0	81	100	100	F	F	T	F	77	YES
13878	241	920211	174525.20	0	100	0	77	100	0	F	T	F	F	77	NO
13878	242	920211	174407.61	80	100	94	81	100	0	F	F	F	F	77	NO
13878	241	920211	174459.73	0	100	0	77	100	0	F	T	F	F	77	NO
13878	241	920211	174808.02	0	100	0	85	100	0	F	T	F	F	77	NO
11145	242	920211	174250.79	100	100	99	69	100	0	F	F	F	F	76	NO
7831	395	920210	223448.82	100	99	98	67	100	0	F	F	F	F	75	NO
13464	399	920211	064413.52	20	97	44	100	100	100	F	F	F	F	75	NO
21538	387	920203	113048.14	20	15	15	94	100	100	F	F	T	F	75	NO
15826	951	920211	085933.98	60	100	98	85	100	0	F	F	F	F	74	NO
7324	242	920210	223733.02	60	100	100	85	100	0	F	F	F	F	74	YES
13878	241	920211	175728.50	60	100	98	82	100	0	F	F	F	F	73	NO
13878	241	920211	173652.59	0	100	0	62	100	0	F	T	F	F	72	NO
13878	242	920211	174036.02	80	100	92	71	100	0	F	F	F	F	72	NO
21223	383	920211	144226.11	100	99	100	64	90	0	F	F	F	F	72	YES
88838	232	920211	092047.21	60	3	30	88	100	0	F	F	T	F	72	YES
20596	382	920211	113849.79	100	94	93	60	100	0	F	F	F	F	71	YES
15206	221	920210	200204.24	60	92	0	70	100	0	F	F	T	F	69	NO
87153	396	920211	175600.24	80	96	42	94	100	0	F	F	F	F	69	YES
8513	242	920210	224108.97	60	100	100	69	100	0	F	F	F	F	68	YES
11145	241	920211	173616.76	60	100	99	69	100	0	F	F	F	F	67	NO
11145	241	920211	175728.50	60	100	99	67	100	0	F	F	F	F	67	NO
11145	242	920211	173743.47	60	100	99	69	100	0	F	F	F	F	67	NO
11145	242	920211	173350.45	60	100	99	69	100	0	F	F	F	F	67	NO
11145	242	920211	174036.02	60	99	99	69	100	0	F	F	F	F	67	NO
19437	396	920211	064921.49	60	100	46	100	100	0	F	F	F	F	67	YES
87356	393	920211	130900.40	60	1	0	78	100	0	F	F	T	F	65	YES
13878	242	920211	173743.47	60	100	91	62	100	0	F	F	F	F	62	NO
13878	241	920211	173616.76	0	96	0	54	100	0	F	T	F	F	62	NO
20946	951	920211	085933.98	60	99	96	54	100	0	F	F	F	F	60	YES
21854	399	920211	174937.89	20	44	0	55	100	100	F	F	T	F	59	YES
21858	369	920211	052003.77	100	85	0	86	100	0	F	F	F	F	59	NO
88079	398	920209	151846.06	0	0	0	77	100	100	F	T	F	F	59	YES

SAT	SNSR	DATE	TIME	OBS	U	V	W	W>10	ID	FH	HALO	AGE	σ	RANK	EXPERT
88079	398	920206	145927.72	80	0	3	88	100	100	F	F	T	T	59	YES
88079	398	920207	165639.68	0	0	0	77	100	100	F	T	F	F	59	YES
13878	242	920211	173350.45	60	100	89	54	100	0	F	F	F	F	58	NO
4637	396	920211	061511.19	0	100	97	100	100	0	F	F	F	F	58	YES
87153	399	920211	041108.28	0	76	0	100	100	100	F	F	F	F	58	YES
87332	393	920211	125447.90	80	84	0	96	100	0	F	F	F	F	57	YES
88856	399	920211	000143.45	20	100	99	53	50	100	F	F	F	F	57	YES
14783	242	920210	223358.66	60	100	100	46	100	0	F	F	F	F	57	YES
20261	385	920210	234322.80	60	98	99	48	100	0	F	F	F	F	57	NO
14783	242	920210	223052.30	60	100	100	44	100	0	F	F	F	F	56	YES
21855	399	920211	023942.32	40	98	53	45	67	100	F	F	F	F	56	YES
14086	242	920210	225302.73	60	100	100	38	100	0	F	F	F	F	54	NO
14086	242	920210	224923.21	60	100	100	38	100	0	F	F	F	F	54	NO
14557	399	920211	051519.34	80	64	0	93	100	0	F	F	F	F	54	NO
88108	221	920210	211716.37	60	99	97	38	100	0	F	F	F	F	53	YES
21858	369	920211	023724.93	100	87	0	67	100	0	F	F	F	F	53	NO
21764	399	920211	212636.05	20	78	87	54	50	100	F	F	F	F	53	NO
21858	399	920211	021948.96	100	86	0	67	100	0	F	F	F	F	53	NO
21855	399	920211	021948.96	60	98	53	31	50	100	F	F	F	F	52	YES
16214	222	920211	120229.50	100	100	99	29	67	0	F	F	F	F	52	NO
88108	243	920211	185826.02	60	100	96	31	100	0	F	F	F	F	50	YES
88788	398	920201	003122.15	0	0	0	92	100	100	F	F	F	F	50	YES
87365	396	920211	100130.79	20	99	35	85	100	0	F	F	T	F	50	YES
87117	399	920211	141607.67	0	0	0	92	100	100	F	F	F	F	50	YES
13464	399	920211	174723.14	0	0	0	92	100	100	F	F	F	F	50	NO
13464	399	920211	174723.14	0	0	0	92	100	100	F	F	F	F	50	NO
21764	329	920211	002941.04	20	90	85	96	100	0	T	F	F	F	50	YES
20799	242	920210	224446.40	100	87	0	0	0	0	F	F	T	F	49	NO
15206	221	920210	195115.32	100	92	0	0	0	0	F	F	T	F	49	NO
13878	241	920211	173725.84	20	100	90	62	100	0	F	F	F	F	48	NO
21872	393	920211	183630.87	20	98	73	96	100	0	F	F	F	T	48	NO
21871	393	920211	183528.97	20	91	47	91	100	0	F	F	F	F	48	NO
3899	743	920126	083727.69	0	0	0	85	100	100	F	F	F	F	48	NO
16262	232	920211	091752.36	40	95	44	77	100	0	F	F	F	F	48	NO
18270	396	920211	040952.82	60	99	68	46	100	0	F	F	F	F	48	NO
88075	399	920210	235354.29	100	0	2	0	30	0	F	F	T	F	48	NO
87117	399	920211	104551.42	0	0	0	85	100	100	F	F	F	F	48	YES
88083	399	920210	235329.99	100	24	8	0	17	0	F	F	T	F	47	NO
2215	232	920211	084751.73	60	87	32	35	75	0	F	F	T	F	46	NO
87333	232	920211	094315.63	60	27	67	63	100	0	F	F	F	F	46	NO
87345	329	920211	080948.96	40	98	89	66	100	0	T	F	F	F	46	NO
12677	242	920210	224108.97	40	100	95	0	0	0	F	F	T	F	45	NO
19113	396	920211	041222.66	80	60	0	71	100	0	F	F	F	F	45	NO
87455	232	920211	053635.68	100	75	74	81	100	0	F	F	F	T	45	NO
12677	242	920210	232656.94	60	99	69	0	0	0	F	F	T	F	44	NO
14515	396	920211	033825.09	80	0	0	77	100	0	F	F	F	F	44	NO
6278	242	920210	232656.94	60	50	0	86	100	0	F	F	F	F	44	NO
88076	399	920211	085821.51	60	66	55	36	25	0	F	F	T	F	44	NO
87207	232	920211	073348.76	20	63	0	38	100	0	F	F	T	F	44	NO
87715	329	920211	003102.63	0	92	80	100	100	0	T	F	F	F	44	NO
87372	399	920211	090543.31	0	32	67	100	100	0	F	F	F	F	44	NO
88072	242	920211	173743.47	60	84	0	31	50	0	F	F	T	F	43	NO
88079	398	920205	183534.10	0	0	0	62	100	100	F	F	F	F	43	YES
17307	329	920211	081411.31	0	92	97	85	100	0	T	F	F	F	42	NO
14665	382	920211	220610.58	0	68	50	92	100	0	F	F	F	F	41	NO
6058	382	920211	180652.43	0	84	23	100	100	0	F	F	F	F	41	NO
21872	393	920211	183437.73	0	100	0	100	100	0	F	F	F	F	41	NO
11622	242	920210	224446.40	60	69	0	72	100	0	F	F	F	F	40	NO
12715	393	920211	224222.40	80	34	0	62	100	0	F	F	F	F	40	NO
21872	393	920211	183720.87	0	100	17	92	100	0	F	F	F	F	40	NO
21872	393	920211	183811.07	0	100	17	92	100	0	F	F	F	F	40	NO
11848	329	920211	032935.70	20	97	100	61	100	0	T	F	F	F	40	NO
15206	221	920210	201942.02	60	91	0	0	0	0	F	F	T	F	39	NO
19484	951	920211	085933.98	60	89	11	0	0	0	F	F	T	F	39	NO

SAT	SNSR	DATE	TIME	OBS	U	V	W	W>10	ID	FH	HALO	AGE	σ	RANK	EXPERT
8980	221	920210	200204.24	0	88	73	69	100	0	F	F	F	F	39	NO
21670	221	920210	195115.32	60	0	0	0	25	0	F	F	T	F	39	NO
87711	232	920211	092047.21	20	64	0	94	100	0	F	F	F	F	38	NO
21872	393	920211	183540.87	0	92	13	92	100	0	F	F	F	F	38	NO
15994	951	920211	085933.98	60	78	0	62	100	0	F	F	F	F	38	NO
21872	393	920211	183529.03	0	100	0	92	100	0	F	F	F	F	38	NO
1864	242	920210	230710.23	20	92	72	56	100	0	F	F	F	F	38	NO
21872	393	920211	183449.70	0	92	13	92	100	0	F	F	F	F	38	NO
21872	393	920211	183414.27	0	76	0	100	100	0	F	F	F	F	38	NO
18538	396	920211	040952.82	60	22	0	29	75	0	F	F	T	F	38	NO
14086	242	920210	223733.02	60	91	0	59	100	0	F	F	F	F	38	NO
21872	393	920211	183709.03	0	96	0	92	100	0	F	F	F	F	37	NO
6826	232	920211	090126.29	20	94	86	41	100	0	F	F	F	F	37	NO
21872	393	920211	183735.50	0	64	0	100	100	0	F	F	F	F	37	NO
20672	222	920211	120805.44	80	0	0	0	0	0	F	F	T	T	37	NO
21872	393	920211	183759.23	0	92	0	92	100	0	F	F	F	F	37	NO
21011	404	920211	041331.80	100	0	0	44	85	0	F	F	F	F	37	NO
11353	242	920210	224108.97	20	100	68	0	0	0	F	F	T	F	37	NO
21872	393	920211	183619.03	0	96	0	92	100	0	F	F	F	F	37	NO
21872	393	920211	183505.27	0	72	0	100	100	0	F	F	F	F	37	NO
21872	393	920211	183555.27	0	72	0	100	100	0	F	F	F	F	37	NO
21538	329	920131	030344.99	0	0	0	77	100	100	T	F	F	F	36	NO
88086	382	920211	035908.09	40	0	0	0	33	0	F	F	T	F	36	NO
13554	242	920210	223733.02	60	35	0	66	100	0	F	F	F	F	36	NO
5795	393	920211	131148.50	0	0	37	92	100	0	F	F	F	F	36	NO
13554	242	920211	173350.45	60	1	0	65	100	0	F	F	F	F	36	NO
87316	242	920210	223358.66	20	87	64	0	0	0	F	F	T	F	36	NO
13814	231	920211	104037.63	20	83	20	81	100	0	F	F	F	F	36	NO
88119	334	920211	130618.89	100	23	52	0	0	0	F	F	T	F	36	NO
20581	393	920211	183619.63	0	0	0	100	100	0	F	F	F	F	35	NO
20581	393	920211	183555.27	0	0	0	100	100	0	F	F	F	F	35	NO
20581	393	920211	183609.77	0	0	0	100	100	0	F	F	F	F	35	NO
21326	398	920201	003122.15	0	0	0	100	100	0	F	F	F	F	35	NO
10829	231	920211	103708.06	0	0	0	100	100	0	F	F	F	F	35	NO
11145	242	920211	175001.63	100	100	97	0	0	0	F	F	F	F	35	NO
10444	396	920211	074246.53	0	0	0	100	100	0	F	F	F	F	35	NO
21870	393	920211	183437.73	0	8	0	100	100	0	F	F	F	F	35	NO
20581	393	920211	183519.73	0	0	0	100	100	0	F	F	F	F	35	NO
20581	393	920211	183645.27	0	0	0	100	100	0	F	F	F	F	35	NO
12155	396	920211	012736.11	0	0	0	100	100	0	F	F	F	F	35	NO
20581	393	920211	183659.87	0	0	0	100	100	0	F	F	F	F	35	NO
20581	393	920211	183759.23	0	0	0	100	100	0	F	F	F	F	35	NO
21870	393	920211	183449.70	0	28	0	100	100	0	F	F	F	F	35	NO
21871	393	920211	183609.77	0	0	0	100	100	0	F	F	F	F	35	NO
21871	393	920211	183645.27	0	0	0	100	100	0	F	F	F	F	35	NO
21870	393	920211	183759.23	0	8	0	100	100	0	F	F	F	F	35	NO
21872	393	920211	183659.87	0	8	0	100	100	0	F	F	F	F	35	NO
21871	393	920211	183437.73	0	24	0	100	100	0	F	F	F	F	35	NO
21871	393	920211	183735.50	0	0	0	100	100	0	F	F	F	F	35	NO
21872	393	920211	183609.77	0	8	0	100	100	0	F	F	F	F	35	NO
21870	393	920211	183709.03	0	8	0	100	100	0	F	F	F	F	35	NO
8178	221	920230	210033.55	0	96	0	85	100	0	F	F	F	F	35	NO
21870	393	920211	183529.03	0	8	0	100	100	0	F	F	F	F	35	NO
21869	393	920211	183414.27	0	0	0	100	100	0	F	F	F	F	35	NO
3874	399	920211	102022.85	0	0	0	100	100	0	F	F	F	F	35	NO
3899	329	920121	101515.05	0	0	0	69	100	100	T	F	F	F	35	NO
115	221	920211	144034.02	20	82	87	41	100	0	F	F	F	F	35	NO
20581	393	920211	183505.27	0	0	0	100	100	0	F	F	F	F	35	NO
16375	396	920211	061147.69	0	0	0	100	100	0	F	F	F	F	35	NO
956	384	920207	161921.30	0	0	0	100	100	0	F	F	F	F	35	NO
18591	399	920211	223833.29	0	0	0	100	100	0	F	F	F	F	35	NO
19502	232	920211	093241.74	0	80	0	92	100	0	F	F	F	F	35	NO
20581	393	920211	183437.73	0	0	0	100	100	0	F	F	F	F	35	NO
3908	221	920210	211939.45	0	0	0	100	100	0	F	F	F	F	35	NO

SAT	SNSR	DATE	TIME	OBS	U	V	W	W>10	ID	FH	HALO	AGE	σ	RANK	EXPERT
21870	393	920211	183636.87	0	28	0	100	100	0	F	F	F	F	35	NO
21872	393	920211	183437.80	0	100	0	85	100	0	F	F	F	F	35	NO
5498	242	920211	175147.94	0	0	0	100	100	0	F	F	F	F	35	NO
87037	399	920211	221310.03	0	0	0	100	100	0	F	F	F	F	35	NO
7017	398	920202	213449.99	0	0	0	100	100	0	F	F	F	F	35	NO
19590	383	920211	131850.04	0	0	0	100	100	0	F	F	F	F	35	NO
20581	393	920211	183414.27	0	0	0	100	100	0	F	F	F	F	35	NO
87117	399	920211	000946.59	0	0	0	100	100	0	F	F	F	F	35	YES
5144	232	920211	073428.79	0	0	0	100	100	0	F	F	F	F	35	NO
12993	232	920211	082926.77	60	41	0	64	100	0	F	F	F	F	35	NO
21872	393	920211	183519.73	0	12	0	100	100	0	F	F	F	F	35	NO
88111	242	920211	173350.45	60	60	0	59	100	0	F	F	F	F	35	NO
21872	393	920211	183528.97	0	96	0	85	100	0	F	F	F	F	35	NO
88079	383	920211	131840.00	20	0	0	9	50	0	F	F	T	F	35	NO
21871	393	920211	183709.03	0	24	0	100	100	0	F	F	F	F	35	NO
21872	393	920211	183429.73	0	16	0	100	100	0	F	F	F	F	35	NO
21872	393	920211	183338.67	0	16	0	100	100	0	F	F	F	F	35	NO
21871	393	920211	183659.87	0	0	0	100	100	0	F	F	F	F	35	NO
87386	221	920210	211939.45	0	20	0	100	100	0	F	F	F	F	35	NO
14909	385	920211	223247.69	0	0	0	100	100	0	F	F	F	F	35	NO
21872	393	920211	183618.97	0	96	0	85	100	0	F	F	F	F	35	NO
14621	393	920211	142857.40	0	4	0	100	100	0	F	F	F	F	35	NO
13878	242	920211	175040.69	100	100	100	0	0	0	F	F	F	F	35	NO
20581	393	920211	183735.50	0	0	0	100	100	0	F	F	F	F	35	NO
20581	393	920211	183709.03	0	0	0	100	100	0	F	F	F	F	35	NO
21870	393	920211	183540.87	0	28	0	100	100	0	F	F	F	F	35	NO
21871	393	920211	183505.27	0	0	0	100	100	0	F	F	F	F	35	NO
21871	393	920211	183414.27	0	0	0	100	100	0	F	F	F	F	35	NO
21870	393	920211	183811.07	0	28	0	100	100	0	F	F	F	F	35	NO
21870	393	920211	183720.87	0	28	0	100	100	0	F	F	F	F	35	NO
21870	393	920211	183735.50	0	0	0	100	100	0	F	F	F	F	35	NO
21870	393	920211	183645.27	0	0	0	100	100	0	F	F	F	F	35	NO
21871	393	920211	183555.27	0	0	0	100	100	0	F	F	F	F	35	NO
10226	385	920124	052920.50	0	80	0	92	100	0	F	F	F	F	35	NO
21871	393	920211	183619.03	0	24	0	100	100	0	F	F	F	F	35	NO
21870	393	920211	183619.03	0	8	0	100	100	0	F	F	F	F	35	NO
88072	241	920211	173652.59	40	85	0	0	33	0	F	F	T	F	34	NO
14096	231	920211	064649.66	0	72	0	92	100	0	F	F	F	F	34	NO
20672	398	920204	111014.06	20	0	0	0	50	0	F	F	T	F	34	NO
6985	393	920211	191448.82	0	72	0	92	100	0	F	F	F	F	34	NO
88111	241	920211	174913.11	60	52	0	58	100	0	F	F	F	F	34	NO
21872	393	920211	183708.97	0	92	0	85	100	0	F	F	F	F	34	NO
7648	242	920210	225629.64	60	0	0	59	100	0	F	F	F	F	34	NO
15206	951	920211	085933.98	40	17	0	0	0	0	F	F	T	F	34	NO
21872	393	920211	183759.13	0	92	0	85	100	0	F	F	F	F	34	NO
20581	393	920211	183720.87	0	0	0	92	100	0	F	F	F	F	33	NO
20581	393	920211	183759.13	0	0	0	92	100	0	F	F	F	F	33	NO
20581	393	920211	183708.97	0	0	0	92	100	0	F	F	F	F	33	NO
21870	393	920211	183338.67	0	0	0	92	100	0	F	F	F	F	33	NO
21870	393	920211	183414.27	0	0	0	92	100	0	F	F	F	F	33	NO
21869	393	920211	183709.03	0	0	0	92	100	0	F	F	F	F	33	NO
21869	393	920211	183645.27	0	0	0	92	100	0	F	F	F	F	33	NO
10178	399	920211	025141.64	0	0	0	92	100	0	F	F	F	F	33	NO
21870	393	920211	183659.87	0	0	0	92	100	0	F	F	F	F	33	NO
21869	393	920211	183759.23	0	0	0	92	100	0	F	F	F	F	33	NO
21870	393	920211	183519.73	0	0	0	92	100	0	F	F	F	F	33	NO
21870	393	920211	183555.27	0	0	0	92	100	0	F	F	F	F	33	NO
20581	393	920211	183630.87	0	0	0	92	100	0	F	F	F	F	33	NO
20717	393	920211	025539.90	0	0	0	92	100	0	F	F	F	F	33	NO
20674	369	920211	172039.88	0	0	0	92	100	0	F	F	F	F	33	NO
20674	369	920211	172039.88	0	0	0	92	100	0	F	F	F	F	33	NO
10144	398	920129	235511.74	0	0	0	92	100	0	F	F	F	F	33	NO
20581	393	920211	183618.97	0	0	0	92	100	0	F	F	F	F	33	NO
20581	393	920211	183540.87	0	0	0	92	100	0	F	F	F	F	33	NO

SAT	SNSR	DATE	TIME	OBS	U	V	W	W>10	ID	FH	HALO	AGE	σ	RANK	EXPERT
13554	241	920211	173616.76	60	1	0	56	100	0	F	F	F	F	33	NO
20581	393	920211	183811.07	0	0	0	92	100	0	F	F	F	F	33	NO
21871	393	920211	183429.73	0	0	0	92	100	0	F	F	F	F	33	NO
21870	393	920211	183429.73	0	0	0	92	100	0	F	F	F	F	33	NO
21869	393	920211	183437.73	0	0	0	92	100	0	F	F	F	F	33	NO
21870	393	920211	183505.27	0	0	0	92	100	0	F	F	F	F	33	NO
87117	399	920211	104520.79	0	0	0	92	100	0	F	F	F	F	33	YES
88010	221	920211	141657.85	20	0	0	0	0	0	F	F	T	F	33	NO
21870	393	920211	183609.77	0	0	0	92	100	0	F	F	F	F	33	NO
21869	393	920211	183529.03	0	0	0	92	100	0	F	F	F	F	33	NO
21869	393	920211	183505.27	0	0	0	92	100	0	F	F	F	F	33	NO
21869	393	920211	183619.03	0	0	0	92	100	0	F	F	F	F	33	NO
4201	393	920211	185325.93	0	0	0	92	100	0	F	F	F	F	33	NO
87387	393	920231	185325.93	0	0	0	92	100	0	F	F	F	F	33	NO
12869	399	920211	051554.33	0	0	0	92	100	0	F	F	F	F	33	NO
12388	393	920211	131534.37	0	0	0	92	100	0	F	F	F	F	33	NO
11708	242	920210	223607.20	0	0	0	92	100	0	F	F	F	F	33	NO
10417	399	920113	055509.32	0	0	0	92	100	0	F	F	F	F	33	NO
87333	393	920211	191017.87	0	0	0	92	100	0	F	F	F	F	33	NO
19995	396	920211	074236.71	0	0	0	92	100	0	F	F	F	F	33	NO
19950	399	920213	152431.18	0	0	0	92	100	0	F	F	F	F	33	NO
20581	393	920211	183449.70	0	0	0	92	100	0	F	F	F	F	33	NO
20581	393	920211	183437.80	0	0	0	92	100	0	F	F	F	F	33	NO
5192	399	920211	171451.74	0	0	0	92	100	0	F	F	F	F	33	NO
20581	393	920211	183529.03	0	0	0	92	100	0	F	F	F	F	33	NO
20581	393	920211	183429.73	0	0	0	92	100	0	F	F	F	F	33	NO
19611	369	920211	125727.81	0	0	0	92	100	0	F	F	F	F	33	NO
19611	369	920211	125727.81	0	0	0	92	100	0	F	F	F	F	33	NO
20581	393	920211	183338.67	0	0	0	92	100	0	F	F	F	F	33	NO
11791	222	920210	201818.77	0	0	0	92	100	0	F	F	F	F	33	NO
19479	383	920211	131850.04	20	0	0	0	0	0	F	F	T	F	33	NO
5795	396	920211	061511.19	0	0	0	92	100	0	F	F	F	F	33	NO
21869	393	920211	183449.70	0	0	0	92	100	0	F	F	F	F	33	NO
13780	399	920211	035324.88	0	0	0	92	100	0	F	F	F	F	33	NO
21869	393	920211	183540.87	0	0	0	92	100	0	F	F	F	F	33	NO
21869	393	920211	183735.50	0	0	0	92	100	0	F	F	F	F	33	NO
2153	385	920211	075717.88	0	0	0	92	100	0	F	F	F	F	33	NO
18689	395	920210	223458.82	0	0	0	92	100	0	F	F	F	F	33	NO
19479	398	920206	120547.77	0	0	0	92	100	0	F	F	F	F	33	NO
21869	393	920211	183555.27	0	0	0	92	100	0	F	F	F	F	33	NO
19163	404	920211	041454.07	100	96	89	0	0	0	F	F	F	F	33	NO
18955	399	920211	053140.08	0	96	70	23	0	100	F	F	F	F	33	NO
8015	399	920211	015706.30	0	0	0	92	100	0	F	F	F	F	33	NO
21871	393	920211	183708.97	0	20	0	92	100	0	F	F	F	F	32	NO
21871	393	920211	183618.97	0	20	0	92	100	0	F	F	F	F	32	NO
21871	393	920211	183759.13	0	20	0	92	100	0	F	F	F	F	32	NO
21870	393	920211	183437.80	0	4	0	92	100	0	F	F	F	F	32	NO
21871	393	920211	183540.87	0	44	0	92	100	0	F	F	F	F	32	NO
21871	393	920211	183759.23	0	24	0	92	100	0	F	F	F	F	32	NO
21870	393	920211	183759.13	0	4	0	92	100	0	F	F	F	F	32	NO
21871	393	920211	183437.80	0	20	0	92	100	0	F	F	F	F	32	NO
21871	393	920211	183811.07	0	40	0	92	100	0	F	F	F	F	32	NO
21870	393	920211	183618.97	0	4	0	92	100	0	F	F	F	F	32	NO
21870	393	920211	183708.97	0	4	0	92	100	0	F	F	F	F	32	NO
21870	393	920211	183528.97	0	4	0	92	100	0	F	F	F	F	32	NO
87394	399	920211	094420.21	20	98	0	0	0	100	F	F	T	F	32	NO
13878	241	920211	174117.68	100	100	82	0	0	0	F	F	F	F	32	NO
88083	399	920210	235311.41	40	72	29	0	33	0	F	F	T	F	32	NO
13554	242	920211	173743.47	60	1	0	50	100	0	F	F	F	F	32	NO
21871	393	920211	183630.87	0	44	0	92	100	0	F	F	F	F	32	NO
21871	393	920211	183449.70	0	44	0	92	100	0	F	F	F	F	32	NO
21871	393	920211	183720.87	0	44	0	92	100	0	F	F	F	F	32	NO
88871	334	920211	165814.93	20	78	0	0	0	0	F	F	T	F	31	NO
7714	242	920210	224108.97	0	64	0	85	100	0	F	F	F	F	31	NO

SAT	SNSR	DATE	TIME	OBS	U	V	W	W>10	ID	FH	HALO	AGE	σ	RANK	EXPERT
2868	369	920211	041558.43	100	0	0	32	61	0	F	F	F	F	31	NO
14086	242	920211	174250.79	100	99	75	0	0	0	F	F	F	F	31	NO
21282	329	920211	193756.79	0	100	0	100	100	0	T	F	F	F	31	NO
13554	242	920211	174036.02	60	1	0	45	100	0	F	F	F	F	31	NO
388	242	920210	223052.30	0	0	0	85	100	0	F	F	F	F	30	NO
17164	398	920123	042305.72	0	0	0	85	100	0	F	F	F	F	30	NO
88114	221	920211	144608.40	60	100	98	23	0	0	F	F	F	F	30	YES
12179	399	920211	153334.38	0	0	0	85	100	0	F	F	F	F	30	NO
1477	398	920205	025953.06	0	0	0	85	100	0	F	F	F	F	30	NO
21869	393	920211	183630.87	0	0	0	85	100	0	F	F	F	F	30	NO
12736	384	920207	161931.34	0	0	0	85	100	0	F	F	F	F	30	NO
5042	398	920128	232902.17	0	0	0	85	100	0	F	F	F	F	30	NO
12321	395	920211	131155.08	0	0	0	85	100	0	F	F	F	F	30	NO
21869	393	920211	183720.87	0	0	0	85	100	0	F	F	F	F	30	NO
10992	396	920211	194036.11	0	0	0	85	100	0	F	F	F	F	30	NO
21869	393	920211	183811.07	0	0	0	85	100	0	F	F	F	F	30	NO
21869	393	920211	183528.97	0	0	0	85	100	0	F	F	F	F	30	NO
21182	222	920211	121159.66	0	0	0	85	100	0	F	F	F	F	30	NO
20581	393	920211	183528.97	0	0	0	85	100	0	F	F	F	F	30	NO
21162	393	920211	191146.42	0	0	0	85	100	0	F	F	F	F	30	NO
1588	396	920211	074256.45	0	0	0	85	100	0	F	F	F	F	30	NO
88111	241	920211	174633.88	60	52	0	46	100	0	F	F	F	F	30	NO
16615	232	920211	083306.92	0	0	0	85	100	0	F	F	F	F	30	NO
10933	399	920211	051730.95	0	0	0	85	100	0	F	F	F	F	30	NO
10755	398	920114	202056.60	0	0	0	85	100	0	F	F	F	F	30	NO
21869	393	920211	183708.97	0	0	0	85	100	0	F	F	F	F	30	NO
10463	383	920211	131950.30	0	0	0	85	100	0	F	F	F	F	30	NO
21869	393	920211	183618.97	0	0	0	85	100	0	F	F	F	F	30	NO
87334	396	920211	182436.04	0	0	0	85	100	0	F	F	F	F	30	NO
5824	393	920211	191146.42	0	0	0	85	100	0	F	F	F	F	30	NO
9951	396	920211	182447.91	0	0	0	85	100	0	F	F	F	F	30	NO
15986	393	920211	220345.70	0	0	0	85	100	0	F	F	F	F	30	NO
9723	399	920211	015451.93	0	32	0	85	100	0	F	F	F	F	30	NO
88917	385	920211	223247.69	0	0	0	85	100	0	F	F	F	F	30	YES
88111	241	920211	174354.95	60	52	0	45	100	0	F	F	F	F	30	NO
87314	329	920211	130624.00	0	92	97	54	100	0	T	F	F	F	30	NO
87241	399	920211	223510.96	0	0	0	85	100	0	F	F	F	F	30	NO
8968	222	920210	201902.81	0	0	0	85	100	0	F	F	F	F	30	NO
87348	393	920211	135325.93	0	0	0	85	100	0	F	F	F	F	30	NO
19950	399	920211	152506.47	0	0	0	85	100	0	F	F	F	F	30	NO
88788	399	920211	223258.96	60	79	48	0	25	0	F	F	T	T	30	NO
20303	383	920211	030700.21	40	0	2	60	100	0	F	F	F	F	30	NO
4330	399	920211	051844.38	0	0	0	85	100	0	F	F	F	F	30	NO
3551	396	920211	184313.72	0	0	0	85	100	0	F	F	F	F	30	NO
21869	393	920211	183759.13	0	0	0	85	100	0	F	F	F	F	30	NO
3758	383	920211	144256.24	0	0	0	85	100	0	F	F	F	F	30	NO
21869	393	920211	183437.80	0	0	0	85	100	0	F	F	F	F	30	NO
700	399	920211	080552.99	0	0	0	85	100	0	F	F	F	F	30	NO
21743	243	920211	195434.07	0	0	0	85	100	0	F	F	F	F	30	NO
88111	241	920211	173616.76	60	60	0	42	100	0	F	F	F	F	29	NO
21835	396	920211	081725.53	40	99	0	45	100	0	F	F	F	F	29	NO
87346	329	920211	193756.79	0	72	100	54	100	0	T	F	F	F	29	NO
20171	385	920211	090946.74	0	60	97	31	100	0	F	F	F	F	29	NO
21506	399	920211	223404.43	0	72	0	77	100	0	F	F	F	F	29	NO
19482	243	920211	185858.68	40	92	76	60	67	0	F	F	F	T	29	NO
14401	399	920211	154301.95	60	0	0	38	100	0	F	F	F	F	29	NO
87711	232	620211	092134.88	0	0	0	77	100	0	F	F	F	F	28	NO
81005	396	920211	194026.24	0	0	0	77	100	0	F	F	F	F	28	NO
2362	396	920209	183745.81	0	0	0	77	100	0	F	F	F	F	28	NO
4330	399	920211	113507.79	0	0	0	77	100	0	F	F	F	F	28	NO
87395	398	920209	095244.27	0	0	0	77	100	0	F	F	F	F	28	NO
87151	393	920211	131309.37	0	0	0	77	100	0	F	F	F	F	28	NO
88924	398	920205	025553.06	0	0	0	77	100	0	F	F	F	F	28	NO
88928	369	920211	050435.26	0	0	0	77	100	0	F	F	F	F	28	NO

SAT	SNSR	DATE	TIME	OBS	U	V	W	W>10	ID	FH	HALO	AGE	σ	RANK	EXPERT
18527	399	920211	011415.85	0	0	0	77	100	0	F	F	F	F	28	NO
18644	393	920211	191058.55	0	0	0	77	100	0	F	F	F	F	28	NO
16720	398	920210	093807.19	0	0	0	77	100	0	F	F	F	F	28	NO
21475	398	920205	130558.03	0	0	0	77	100	0	F	F	F	F	28	NO
13911	232	920211	083534.22	0	0	0	77	100	0	F	F	F	F	28	NO
21848	398	920204	111031.90	0	0	0	77	100	0	F	F	F	F	28	NO
4158	398	920208	132305.70	0	0	0	77	100	0	F	F	F	F	28	NO
3784	399	920211	121422.99	0	0	0	77	100	0	F	F	F	F	28	NO
3748	399	920211	041004.20	0	0	0	77	100	0	F	F	F	F	28	NO
19822	232	920211	074001.84	0	0	0	77	100	0	F	F	F	F	28	NO
20572	369	920211	125135.21	0	0	0	77	100	0	F	F	F	F	28	NO
20572	369	920211	125135.21	0	0	0	77	100	0	F	F	F	F	28	NO
16719	399	920210	205626.24	0	0	0	77	100	0	F	F	F	F	28	NO
15832	399	920211	044219.88	0	0	0	77	100	0	F	F	F	F	28	NO
4654	396	920211	100130.79	0	0	0	77	100	0	F	F	F	F	28	NO
4327	242	920210	232803.48	0	64	0	77	100	0	F	F	F	F	28	NO
10184	399	920211	154334.42	0	0	0	77	100	0	F	F	F	F	28	NO
10338	399	920211	104927.81	0	0	0	77	100	0	F	F	F	F	28	NO
8789	393	920211	190627.82	0	0	0	77	100	0	F	F	F	F	28	NO
4863	393	920211	191058.55	0	0	0	77	100	0	F	F	F	F	28	NO
4981	393	920211	182853.30	0	0	0	77	100	0	F	F	F	F	28	NO
7015	399	920231	203800.34	0	64	77	0	0	100	F	F	F	F	28	NO
20805	385	920124	052920.50	0	32	0	77	100	0	F	F	F	F	27	NO
16497	222	920211	120229.50	100	94	52	0	0	0	F	F	F	F	27	NO
12139	396	920211	175606.24	80	22	0	67	100	0	F	F	F	T	27	NO
6085	232	920211	060335.96	20	94	90	50	50	0	F	F	F	F	27	NO
7324	242	920210	225302.73	60	87	0	50	75	0	F	F	F	F	27	NO
7487	243	920211	195321.20	40	85	79	44	67	0	F	F	F	F	27	NO
18965	396	920211	035934.63	40	39	0	56	100	0	F	F	F	F	27	NO
18538	396	920211	035934.63	40	0	0	0	0	0	F	F	T	F	27	NO
18418	398	920208	050528.32	0	16	0	77	100	0	F	F	F	F	27	NO
14086	241	920211	174633.88	60	100	99	0	0	0	F	F	F	F	26	NO
88112	221	920211	141612.28	60	100	100	0	0	0	F	F	F	F	26	YES
88075	951	920211	085933.98	40	0	0	0	0	0	F	F	T	T	26	NO
88082	233	920211	094537.73	20	11	0	0	0	0	F	F	T	T	26	NO
88117	231	920211	064649.66	60	100	100	0	0	0	F	F	F	F	26	YES
88120	334	920207	071228.77	100	0	0	0	33	0	F	F	T	T	26	NO
88035	232	920211	075122.26	60	63	0	0	0	0	F	F	T	T	26	NO
223	396	920211	100130.79	0	0	0	69	100	0	F	F	F	F	26	NO
88067	242	920211	173350.45	60	49	0	0	0	0	F	F	T	T	26	NO
88117	231	920211	075734.75	60	100	100	0	0	0	F	F	F	F	26	NO
88120	242	920211	173350.45	60	0	0	0	25	0	F	F	T	T	26	NO
88120	241	920211	173319.96	20	0	0	0	0	0	F	F	T	T	26	NO
152	396	920211	061207.43	0	0	0	69	100	0	F	F	F	F	26	NO
20827	399	920211	031835.67	0	0	0	69	100	0	F	F	F	F	26	NO
21376	396	920211	100402.07	0	0	0	69	100	0	F	F	F	F	26	NO
14086	241	920211	174117.68	60	100	99	0	0	0	F	F	F	F	26	NO
21011	369	920211	035325.95	100	0	0	20	40	0	F	F	F	F	26	NO
21659	232	920211	083904.72	100	20	0	0	17	0	F	F	T	T	26	NO
1959	232	920211	052011.96	0	0	0	69	100	0	F	F	F	F	26	NO
1347	399	920211	123854.69	0	0	0	69	100	0	F	F	F	F	26	NO
13878	241	920211	173159.75	60	100	100	0	0	0	F	F	F	F	26	NO
13878	241	920211	172857.63	60	100	89	15	0	0	F	F	F	F	26	NO
14086	241	920211	174913.11	60	100	99	0	0	0	F	F	F	F	26	NO
20308	383	920211	132010.39	0	0	0	69	100	0	F	F	F	F	26	NO
88083	222	920211	120844.16	40	71	57	0	33	0	F	F	T	T	26	NO
88111	241	920211	174117.68	60	52	0	31	100	0	F	F	F	F	26	NO
13815	233	920211	094258.77	0	0	0	69	100	0	F	F	F	F	26	NO
14086	241	920211	174354.95	60	100	99	0	0	0	F	F	F	F	26	NO
14131	232	920211	052128.54	0	0	0	69	100	0	F	F	F	F	26	NO
88737	241	920211	173616.76	40	30	0	0	33	0	F	F	T	T	26	NO
12283	221	920210	211850.51	0	0	0	69	100	0	F	F	F	F	26	NO
7842	399	920205	214705.85	0	0	0	69	100	0	F	F	F	F	26	NO
16214	221	920211	144012.71	60	99	99	0	0	0	F	F	F	F	26	NO

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88848	399	920211	031524.51	40	0	0	0	33	0	F	F	T	T	26	NO
4881	242	920210	230244.97	60	94	0	0	25	0	F	F	T	F	26	NO
88884	398	920206	143035.10	40	0	0	0	0	0	F	F	T	T	26	NO
88879	232	920211	100911.49	20	51	0	0	50	0	F	F	T	T	26	NO
88888	242	920210	224923.21	60	0	0	0	0	0	F	F	T	T	26	NO
88868	241	920211	175728.50	60	0	0	0	25	0	F	F	T	T	26	NO
88868	242	920211	175709.66	20	0	0	0	0	0	F	F	T	T	26	NO
18272	396	920211	184303.83	0	0	0	69	100	0	F	F	F	F	26	NO
18606	398	920128	233002.62	0	0	0	69	100	0	F	F	F	F	26	NO
11353	243	920211	195321.20	60	37	20	0	0	0	F	F	T	T	26	NO
87371	232	920211	085601.02	100	79	0	16	29	0	F	F	T	T	26	NO
87346	329	920211	212117.31	40	95	99	38	67	0	T	F	F	F	26	NO
4942	399	920211	203747.63	0	52	57	8	0	100	F	F	F	F	26	NO
4881	242	920210	230559.01	60	94	0	0	0	0	F	F	T	F	26	NO
87353	232	920211	050842.67	40	13	0	23	33	0	F	F	T	T	26	NO
7162	242	920211	175401.07	0	20	0	69	100	0	F	F	F	F	25	NO
7210	232	920211	073938.33	20	9	0	59	100	0	F	F	F	F	25	NO
20557	233	920211	094223.80	0	60	0	69	100	0	F	F	F	F	25	NO
7443	395	920210	223448.82	100	74	0	18	20	0	F	F	F	F	25	NO
196	745	920115	003744.03	0	0	0	62	100	0	F	F	F	F	24	NO
166	398	920202	124852.63	0	0	0	62	100	0	F	F	F	F	24	NO
11145	241	920211	173159.75	60	100	88	0	0	0	F	F	F	F	24	NO
12947	398	920201	114549.92	0	0	0	62	100	0	F	F	F	F	24	NO
13073	390	920211	100024.22	0	0	0	62	100	0	F	F	F	F	24	NO
10365	242	920210	223052.30	60	3	0	41	75	0	F	F	F	F	24	NO
263	399	920211	053140.08	0	0	0	62	100	0	F	F	F	F	24	NO
10617	399	920211	101030.77	0	0	0	62	100	0	F	F	F	F	24	NO
5435	399	920211	011328.18	0	0	0	62	100	0	F	F	F	F	24	NO
4869	398	920210	093716.01	0	0	0	62	100	0	F	F	F	F	24	NO
5281	396	920211	205718.99	0	0	0	62	100	0	F	F	F	F	24	NO
15054	334	920211	123751.07	0	0	0	62	100	0	F	F	F	F	24	NO
14176	393	920211	191315.07	0	0	0	62	100	0	F	F	F	F	24	NO
20646	334	920211	052042.33	0	0	0	62	100	0	F	F	F	F	24	NO
21346	383	920211	131930.21	0	0	0	62	100	0	F	F	F	F	24	NO
19656	399	920211	101933.53	0	0	0	62	100	0	F	F	F	F	24	NO
19960	221	920210	211850.51	0	0	0	62	100	0	F	F	F	F	24	NO
1370	399	920211	025141.64	0	0	0	62	100	0	F	F	F	F	24	NO
21506	398	920131	234351.53	0	0	0	62	100	0	F	F	F	F	24	NO
10013	385	920211	090755.60	0	0	0	62	100	0	F	F	F	F	24	NO
9826	399	920211	063818.29	0	0	0	62	100	0	F	F	F	F	24	NO
19362	382	920211	035847.67	0	0	0	62	100	0	F	F	F	F	24	NO
18645	396	920211	074226.79	0	8	0	62	100	0	F	F	F	F	24	NO
10092	232	920211	073534.40	60	91	44	49	50	0	F	F	F	F	24	NO
19473	398	920208	050624.96	0	0	0	62	100	0	F	F	F	F	24	NO
87947	398	920210	045915.51	0	0	0	62	100	0	F	F	F	F	24	NO
87947	396	920211	195236.22	0	0	0	62	100	0	F	F	F	F	24	NO
16963	369	920211	050100.73	100	95	20	0	0	0	F	F	F	F	24	NO
18571	242	920210	232056.94	60	61	0	49	75	0	F	F	F	F	24	NO
7213	393	920211	191058.55	0	0	0	62	100	0	F	F	F	F	24	NO
979	393	920211	182608.23	0	0	0	62	100	0	F	F	F	F	24	NO
7959	399	920211	011415.85	0	0	0	62	100	0	F	F	F	F	24	NO
12102	231	920211	075734.75	0	20	0	62	100	0	F	F	F	F	23	NO
88108	242	920210	224108.97	60	88	0	34	75	0	F	F	F	F	23	NO
87711	232	920211	092159.30	0	20	0	62	100	0	F	F	F	F	23	NO
88033	241	920211	173019.24	80	0	0	0	20	0	F	F	T	F	23	NO
7088	329	920211	193756.79	0	0	0	92	100	0	T	F	F	F	23	NO
8314	329	920211	001602.91	0	0	0	92	100	0	T	F	F	F	23	NO
4664	395	920213	131155.08	0	72	0	62	100	0	F	F	F	F	23	NO
18997	242	920211	175641.24	20	62	0	56	100	0	F	F	F	F	23	NO
13554	242	920211	174250.79	100	1	0	18	11	0	F	F	F	F	23	NO
18985	385	920124	052920.50	0	92	0	54	100	0	F	F	F	F	23	NO
6085	329	920211	003625.65	0	0	0	92	100	0	T	F	F	F	23	NO
14086	241	920211	173159.75	60	100	82	0	0	0	F	F	F	F	23	NO
3093	329	920211	083930.42	0	0	0	92	100	0	T	F	F	F	23	NO

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9416	242	920210	224446.40	60	0	0	36	75	0	F	F	F	F	23	NO
14783	242	920210	224446.40	60	76	0	43	75	0	F	F	F	F	23	NO
17116	399	920211	080611.17	0	40	0	62	100	0	F	F	F	F	22	NO
87346	398	920210	094148.35	0	0	0	54	100	0	F	F	F	F	22	NO
4231	393	920211	064713.93	0	0	0	54	100	0	F	F	F	F	22	NO
13177	243	920211	195345.85	40	100	100	0	0	0	F	F	F	F	22	NO
9799	396	920119	123453.02	0	0	0	54	100	0	F	F	F	F	22	NO
10718	399	920211	223435.15	0	0	0	54	100	0	F	F	F	F	22	NO
12879	395	920211	131155.08	0	80	60	38	100	0	F	F	F	F	22	NO
1312	399	920211	015337.55	0	0	0	54	100	0	F	F	F	F	22	NO
11145	241	920211	172857.63	60	100	75	2	0	0	F	F	F	F	22	NO
12322	221	920210	195115.32	20	92	67	59	100	0	F	F	F	T	22	NO
14086	241	920211	172857.63	40	100	99	0	0	0	F	F	F	F	22	NO
13515	222	920210	201818.77	0	0	0	54	100	0	F	F	F	F	22	NO
12564	404	920210	192500.81	100	0	0	0	29	0	F	F	F	F	22	NO
17872	242	920210	224446.40	60	40	0	42	75	0	F	F	F	F	22	NO
5498	242	920211	175001.63	20	15	0	48	100	0	F	F	F	F	22	NO
15679	242	920211	175001.63	100	20	0	0	31	0	F	F	F	F	22	NO
4193	399	920211	011415.85	0	0	0	54	100	0	F	F	F	F	22	NO
2367	398	920206	143035.10	0	0	0	54	100	0	F	F	F	F	22	NO
5322	399	920210	235311.41	0	0	0	54	100	0	F	F	F	F	22	NO
3843	399	920211	085915.18	0	0	0	54	100	0	F	F	F	F	22	NO
1778	398	920127	005053.62	0	0	0	54	100	0	F	F	F	F	22	NO
21848	398	920209	095244.27	0	0	0	54	100	0	F	F	F	F	22	NO
3794	396	920211	100004.44	0	60	0	62	100	0	F	F	F	F	22	NO
3749	398	920131	052028.33	0	0	0	54	100	0	F	F	F	F	22	NO
15783	396	920211	100130.79	0	0	0	54	100	0	F	F	F	F	22	NO
16209	232	920211	052102.97	20	86	91	37	50	0	F	F	F	F	22	NO
15935	398	920210	094148.35	0	0	0	54	100	0	F	F	F	F	22	NO
8402	383	920211	131900.09	0	0	0	54	100	0	F	F	F	F	22	NO
21870	329	920211	153245.25	0	40	0	92	100	0	T	F	F	F	22	NO
21150	399	920211	011328.18	0	0	0	54	100	0	F	F	F	F	22	NO
7074	221	920211	141832.10	0	0	0	54	100	0	F	F	F	F	22	NO
20055	232	920211	053635.68	0	0	0	54	100	0	F	F	F	F	22	NO
19853	232	920211	073534.40	0	0	0	54	100	0	F	F	F	F	22	NO
2361	242	920211	175147.94	0	0	0	46	100	0	F	F	F	F	21	NO
19169	404	920211	041616.34	0	0	0	46	100	0	F	F	F	F	21	NO
13666	369	920211	042832.11	0	0	0	46	100	0	F	F	F	F	21	NO
235	393	920211	220213.80	0	0	0	46	100	0	F	F	F	F	21	NO
14715	232	920211	073534.40	0	0	0	46	100	0	F	F	F	F	21	NO
14086	241	920211	175728.50	60	99	75	0	0	0	F	F	F	F	21	NO
14086	242	920211	173356.45	60	99	76	0	0	0	F	F	F	F	21	NO
14034	369	920211	030543.80	100	0	0	0	0	0	F	F	F	F	21	NO
15340	232	920211	082926.77	0	0	0	46	100	0	F	F	F	F	21	NO
16968	369	920211	050100.73	100	70	0	0	0	0	F	F	F	F	21	NO
18965	232	920211	073327.14	0	0	0	46	100	0	F	F	F	F	21	NO
14086	241	920211	173616.76	60	99	76	0	0	0	F	F	F	F	21	NO
4330	399	920211	031423.87	0	0	0	46	100	0	F	F	F	F	21	NO
21444	398	920209	115754.19	0	0	0	46	100	0	F	F	F	F	21	NO
21499	399	920211	113507.79	0	0	0	46	100	0	F	F	F	F	21	NO
18591	399	920211	100951.00	0	0	0	46	100	0	F	F	F	F	21	NO
13554	242	920211	175001.63	100	2	0	0	0	0	F	F	F	F	21	NO
14086	242	920211	173743.47	60	99	76	0	0	0	F	F	F	F	21	NO
14086	242	920211	174036.02	60	99	76	0	0	0	F	F	F	F	21	NO
5761	399	920203	220536.66	0	0	0	46	100	0	F	F	F	F	21	NO
8745	232	920211	085601.02	0	0	0	46	100	0	F	F	F	F	21	NO
3974	395	920211	131155.08	0	0	0	46	100	0	F	F	F	F	21	NO
19560	398	920209	151846.06	0	0	0	46	100	0	F	F	F	F	21	NO
6681	398	920206	095345.03	0	0	0	46	100	0	F	F	F	F	21	NO
21404	232	920211	051429.24	0	0	0	46	100	0	F	F	F	F	21	NO
21115	232	920211	084013.83	60	48	0	52	100	0	F	F	F	T	21	NO
7035	222	920210	200639.51	20	0	0	38	100	0	F	F	F	F	21	NO
20465	399	920211	080517.12	0	0	0	46	100	0	F	F	F	F	21	NO
20833	383	920211	201906.84	0	0	0	46	100	0	F	F	F	F	21	NO

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21011	369	920211	050100.73	100	0	0	0	0	0	F	F	F	F	21	NO
21223	383	920128	114546.87	0	0	0	0	0	100	F	F	F	F	21	NO
3825	232	920211	091818.53	0	76	0	54	100	0	F	F	F	F	21	NO
21011	369	920211	022437.88	100	0	0	0	0	0	F	F	F	F	21	NO
21011	369	920211	030327.21	100	0	0	0	0	0	F	F	F	F	21	NO
967	384	920207	161921.30	0	0	0	46	100	0	F	F	F	F	21	NO
21872	329	920211	153245.25	0	72	0	85	100	0	T	F	F	F	21	NO
10183	398	920126	232902.17	0	0	0	46	100	0	F	F	F	F	21	NO
11145	241	920211	174354.95	60	100	75	0	0	0	F	F	F	F	21	NO
11145	241	920211	174633.88	60	100	74	0	0	0	F	F	F	F	21	NO
11145	241	920211	174913.13	60	100	74	0	0	0	F	F	F	F	21	NO
11145	241	920211	174117.68	60	100	74	0	0	0	F	F	F	F	21	NO
88111	242	920211	174250.79	100	60	0	0	0	0	F	F	F	F	21	NO
88119	334	920211	131922.29	40	21	40	0	0	0	F	F	T	F	21	NO
87383	399	920211	113747.66	0	0	0	46	100	0	F	F	F	F	21	NO
87394	399	920211	143508.67	0	0	0	46	100	0	F	F	F	F	21	NO
12897	404	920210	192609.43	100	51	0	0	13	0	F	F	F	F	21	NO
88111	242	920211	175001.63	100	59	0	0	0	0	F	F	F	F	21	NO
5281	398	920209	072430.52	0	0	0	46	100	0	F	F	F	F	21	NO
5076	398	920209	151846.06	0	0	0	46	100	0	F	F	F	F	21	NO
21869	329	920211	153245.25	0	16	0	85	100	0	T	F	F	F	20	NO
5349	329	920211	083930.42	0	0	0	85	100	0	T	F	F	F	20	NO
88111	242	920211	173743.47	60	59	0	36	75	0	F	F	F	F	20	NO
4647	241	920211	172952.42	20	95	80	40	50	0	F	F	F	F	20	NO
17719	232	920211	051401.39	0	68	0	54	100	0	F	F	F	F	20	NO
5498	242	920211	175257.00	0	52	0	54	100	0	F	F	F	F	20	NO
87346	329	920211	064807.63	0	72	90	38	100	0	T	F	F	F	20	NO
12864	329	920211	064807.63	0	0	0	85	100	0	T	F	F	F	20	NO
10454	329	920211	075245.98	0	0	0	85	100	0	T	F	F	F	20	NO
22	329	920211	000827.75	0	0	0	85	100	0	T	F	F	F	20	NO
21538	745	920125	150400.32	0	4	0	0	0	100	F	F	F	F	20	NO
20581	329	920211	153245.25	0	20	0	85	100	0	T	F	F	F	20	NO
21438	329	920211	195137.60	0	0	0	85	100	0	T	F	F	F	20	NO
21871	329	920211	153245.25	0	52	0	85	100	0	T	F	F	F	20	NO
1271	393	920211	224415.30	0	36	0	54	100	0	F	F	F	F	20	NO
87398	232	920211	050842.67	20	66	88	0	50	0	F	F	T	F	19	NO
11718	398	920119	171545.10	100	55	0	95	100	100	F	F	T	T	19	NO
10365	242	920210	230640.35	80	84	0	0	40	0	F	F	F	F	19	NO
4642	242	920210	225040.46	20	92	83	32	50	0	F	F	F	F	19	NO
18589	232	920211	073221.36	0	0	0	38	100	0	F	F	F	F	19	NO
21341	398	920131	233930.20	0	76	0	46	100	0	F	F	F	F	19	NO
4384	393	920211	191140.42	0	0	0	38	100	0	F	F	F	F	19	NO
4421	383	920211	144256.24	0	0	0	38	100	0	F	F	F	F	19	NO
12257	398	920131	192428.77	0	88	0	38	100	0	F	F	F	F	19	NO
4382	396	920210	235934.85	0	0	0	38	100	0	F	F	F	F	19	NO
87309	399	920209	210835.47	0	0	0	38	100	0	F	F	F	F	19	NO
87207	232	920211	073534.40	0	0	0	38	100	0	F	F	F	F	19	NO
1272	393	920211	220213.80	0	0	0	38	100	0	F	F	F	F	19	NO
3748	232	920211	095328.07	40	88	0	50	67	0	F	F	F	F	19	NO
14693	398	920131	052028.33	0	0	0	38	100	0	F	F	F	F	19	NO
3938	399	920211	080733.76	0	0	0	38	100	0	F	F	F	F	19	NO
2702	398	920210	094148.35	0	0	0	38	100	0	F	F	F	F	19	NO
20262	398	920128	233141.60	0	0	0	38	100	0	F	F	F	F	19	NO
3462	232	920211	074001.84	0	0	0	38	100	0	F	F	F	F	19	NO
14503	385	920211	090537.90	0	0	0	38	100	0	F	F	F	F	19	NO
3555	396	920122	023456.12	0	0	0	38	100	0	F	F	F	F	19	NO
6843	398	920208	120547.77	0	0	0	38	100	0	F	F	F	F	19	NO
4964	395	920210	223456.82	0	0	0	38	100	0	F	F	F	F	19	NO
14694	399	920211	220612.01	0	0	0	38	100	0	F	F	F	F	19	NO
9681	393	920211	064713.93	0	0	0	38	100	0	F	F	F	F	19	NO
2777	398	920208	120646.15	0	0	0	38	100	0	F	F	F	F	19	NO
8462	232	920211	053816.92	80	93	20	0	0	0	F	F	F	F	19	NO
13905	399	920211	133825.31	0	0	0	38	100	0	F	F	F	F	19	NO

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2177	399	920210	205651.27	0	0	0	31	100	0	F	F	F	F	18	NO
12294	393	920211	064713.93	0	0	0	31	100	0	F	F	F	F	18	NO
21872	393	920211	105114.03	0	0	0	31	100	0	F	F	F	F	18	NO
21871	393	920211	105114.03	0	0	0	31	100	0	F	F	F	F	18	NO
10760	399	920211	171158.80	0	0	0	31	100	0	F	F	F	F	18	NO
7076	393	920211	191017.87	0	0	0	31	100	0	F	F	F	F	18	NO
88067	241	920211	173345.84	0	0	0	31	100	0	F	F	F	F	18	NO
5531	393	920211	220345.70	0	0	0	31	100	0	F	F	F	F	18	NO
5417	398	920210	094148.35	0	0	0	31	100	0	F	F	F	F	18	NO
5763	399	920211	113545.63	0	0	0	31	100	0	F	F	F	F	18	NO
21087	399	920211	004827.72	0	84	3	38	100	0	F	F	F	F	18	NO
15157	398	920206	142740.82	0	0	0	31	100	0	F	F	F	F	18	NO
20581	393	920211	105114.03	0	0	0	31	100	0	F	F	F	F	18	NO
13878	241	920211	174633.88	40	100	80	0	0	0	F	F	F	F	18	NO
3912	396	920211	195226.35	0	0	0	31	100	0	F	F	F	F	18	NO
649	399	920211	050733.42	0	0	0	31	100	0	F	F	F	F	18	NO
17123	398	920115	235247.13	0	0	0	31	100	0	F	F	F	F	18	NO
18471	329	920211	000514.37	0	0	0	77	100	0	T	F	F	F	18	NO
21691	329	920211	043739.26	0	0	0	77	100	0	T	F	F	F	18	NO
21447	221	920210	201942.02	0	0	0	31	100	0	F	F	F	F	18	NO
447	329	920211	122649.15	0	0	0	77	100	0	T	F	F	F	18	NO
17141	393	920211	191017.87	0	0	0	31	100	0	F	F	F	F	18	NO
16390	396	920211	061217.30	0	0	0	31	100	0	F	F	F	F	18	NO
13814	231	920211	103954.72	0	0	0	31	100	0	F	F	F	F	18	NO
15027	404	920211	041331.80	80	0	0	0	40	0	F	F	F	F	18	NO
20510	399	920211	011134.04	0	0	0	31	100	0	F	F	F	F	18	NO
13878	241	920211	174913.11	40	100	79	0	0	0	F	F	F	F	18	NO
13904	243	920211	135826.02	0	0	0	31	100	0	F	F	F	F	18	NO
6278	242	920210	223358.66	60	99	0	41	75	0	F	F	F	T	17	NO
14195	231	920211	103954.72	80	62	0	0	40	0	F	F	F	F	17	NO
10579	232	920211	084751.73	60	84	0	34	75	0	F	F	F	T	17	NO
20662	951	920211	085933.98	60	91	53	0	0	0	F	F	F	F	17	NO
21011	369	920211	023208.99	80	0	0	0	0	0	F	F	F	F	16	NO
21011	369	920211	030916.93	80	0	0	0	0	0	F	F	F	F	16	NO
8084	329	920211	193756.79	0	0	0	69	100	0	T	F	F	F	16	NO
12770	329	920211	081032.68	0	0	0	69	100	0	T	F	F	F	16	NO
20624	329	920211	153935.33	0	0	0	69	100	0	T	F	F	F	16	NO
9819	329	920211	225736.68	0	0	0	69	100	0	T	F	F	F	16	NO
3174	221	920211	144012.71	60	0	0	12	50	0	F	F	F	F	16	NO
14034	369	920211	030910.93	80	0	0	0	0	0	F	F	F	F	16	NO
13878	242	920211	175001.63	0	96	97	0	0	0	F	F	F	F	16	NO
10447	232	920211	092134.88	20	90	88	11	0	0	F	F	F	F	16	NO
4881	242	920210	223052.30	20	32	0	0	0	0	F	F	T	F	16	NO
5010	393	920211	224607.33	0	0	97	15	0	0	F	F	F	F	16	NO
5015	329	920211	122649.15	0	0	0	69	100	0	T	F	F	F	16	NO
4744	221	920210	202051.21	0	60	0	38	100	0	F	F	F	F	16	NO
6085	232	920211	060132.72	20	96	87	6	0	0	F	F	F	F	16	NO
7079	329	920117	033604.77	0	0	0	69	100	0	T	F	F	F	16	NO
3749	329	920211	040254.32	0	0	0	69	100	0	T	F	F	F	16	NO
12897	242	920210	223052.30	60	99	28	0	0	0	F	F	F	F	15	NO
12897	242	920210	223358.66	60	99	28	0	0	0	F	F	F	F	15	NO
5581	232	920211	073057.02	40	92	11	36	67	0	F	F	F	F	15	NO
12212	231	920211	124108.50	0	24	20	31	100	0	F	F	F	F	15	NO
20962	242	920210	224923.21	60	0	0	3	50	0	F	F	F	F	15	NO
11080	232	920211	095328.07	0	28	0	31	100	0	F	F	F	F	15	NO
19105	242	920211	174459.73	20	86	79	26	50	0	F	F	F	F	15	NO
13554	242	620210	225040.46	0	0	0	15	0	0	F	T	F	F	14	NO
1843	329	920211	212305.36	0	0	0	62	100	0	T	F	F	F	14	NO
13177	243	920211	195321.20	0	96	87	0	0	0	F	F	F	F	14	NO
13554	242	920210	225302.73	60	0	0	15	0	0	F	F	F	F	14	NO
14086	243	920211	195321.20	60	95	12	0	0	0	F	F	F	F	14	NO
4969	329	920211	081128.50	0	0	0	62	100	0	T	F	F	F	14	NO
4237	329	920211	035432.62	0	0	0	62	100	0	T	F	F	F	14	NO

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6278	242	920210	223052.30	60	99	1	0	0	0	F	F	F	F	14	NO
11708	242	920210	232056.94	60	98	12	0	0	0	F	F	F	F	14	NO
88108	242	920210	232656.94	60	94	0	0	0	0	F	F	F	F	14	NO
14086	242	920210	230559.01	60	97	4	0	0	0	F	F	F	F	14	NO
14086	242	920210	230912.44	60	97	4	0	0	0	F	F	F	F	14	NO
21872	329	920211	170643.38	0	72	37	62	100	0	T	F	F	F	14	NO
14086	242	920210	224446.40	60	96	1	0	0	0	F	F	F	F	14	NO
14086	242	920210	225947.88	60	96	5	0	0	0	F	F	F	F	14	NO
14086	242	920210	230244.97	60	96	3	0	0	0	F	F	F	F	14	NO
3784	329	920211	153935.33	0	0	0	62	100	0	T	F	F	F	14	NO
14555	329	920211	194610.19	0	0	0	62	100	0	T	F	F	F	14	NO
2639	232	920211	084013.83	60	85	42	0	0	0	F	F	F	F	14	NO
10723	221	920211	144012.71	60	99	0	0	25	0	F	F	F	F	14	NO
1377	329	920211	081032.68	0	0	0	62	100	0	T	F	F	F	14	NO
20717	383	920211	025439.64	60	83	45	0	25	0	F	F	F	F	14	NO
14501	329	920211	000514.37	0	0	0	62	100	0	T	F	F	F	14	NO
16497	221	920211	144012.71	60	86	13	0	0	0	F	F	F	F	13	NO
21871	329	920211	170643.38	0	72	0	62	100	0	T	F	F	F	13	NO
21471	396	920211	041222.66	20	0	0	43	50	0	F	F	F	F	13	NO
16533	232	920211	091049.88	60	74	37	0	0	0	F	F	F	F	13	NO
87394	399	920211	094657.86	20	87	0	9	0	0	F	F	T	F	13	NO
6976	233	920211	094223.80	60	0	0	0	25	0	F	F	F	F	13	NO
14783	242	920210	223733.02	60	85	0	0	0	0	F	F	F	F	13	NO
11622	242	920210	225302.73	60	91	0	0	0	0	F	F	F	F	13	NO
2639	232	920211	083818.91	60	84	38	0	25	0	F	F	F	F	13	NO
21552	241	920211	172857.63	60	0	0	0	25	0	F	F	F	F	13	NO
13269	951	920211	085933.98	60	89	9	0	0	0	F	F	F	F	13	NO
21429	232	920211	052307.17	60	91	0	0	0	0	F	F	F	F	13	NO
15246	241	920211	175728.50	60	0	0	0	25	0	F	F	F	F	13	NO
738	242	920210	225629.64	40	0	0	3	67	0	F	F	F	F	13	NO
88033	242	920211	173350.45	20	0	0	0	0	0	F	F	T	F	13	NO
10365	242	920210	230244.97	60	85	0	0	0	0	F	F	F	F	13	NO
11622	242	920210	224923.21	60	91	0	0	0	0	F	F	F	F	13	NO
10246	232	920211	073057.02	20	80	81	0	0	0	F	F	F	F	13	NO
9852	242	920210	225629.64	60	0	0	0	0	0	F	F	F	F	12	NO
7273	396	920211	074226.79	40	0	0	22	33	0	F	F	F	F	12	NO
2222	232	920211	083818.91	60	82	0	0	0	0	F	F	F	F	12	NO
20581	329	920211	170043.38	0	36	0	62	100	0	T	F	F	F	12	NO
13554	241	920211	174354.95	60	13	0	0	0	0	F	F	F	F	12	NO
13554	241	920211	174633.88	60	13	0	0	0	0	F	F	F	F	12	NO
20962	242	920210	225302.73	60	0	0	0	0	0	F	F	F	F	12	NO
15935	329	920211	193756.79	0	0	0	54	100	0	T	F	F	F	12	NO
17239	232	920211	052307.17	0	76	87	0	0	0	F	F	F	F	12	NO
13554	241	920211	172857.63	60	13	0	0	0	0	F	F	F	F	12	NO
20669	399	920211	031608.99	40	0	51	0	0	0	F	F	F	F	12	NO
14240	232	920211	053905.00	0	84	83	0	0	0	F	F	F	F	12	NO
12166	329	920211	043719.26	0	0	0	54	100	0	T	F	F	F	12	NO
15246	242	920211	175641.24	60	0	0	0	0	0	F	F	F	F	12	NO
13554	241	920211	174117.68	60	13	0	0	0	0	F	F	F	F	12	NO
13554	241	920211	173159.75	60	7	0	0	0	0	F	F	F	F	12	NO
21870	329	920211	170643.38	0	60	0	62	100	0	T	F	F	F	12	NO
15767	396	920211	061147.69	60	79	0	5	0	0	F	F	F	F	12	NO
13554	241	920211	175728.50	60	1	0	0	0	0	F	F	F	F	12	NO
10365	242	920210	223358.66	60	3	0	0	0	0	F	F	F	F	12	NO
4881	242	920210	225947.88	60	94	0	43	75	0	F	F	T	T	12	NO
13554	241	920211	174913.11	60	13	0	0	0	0	F	F	F	F	12	NO
11622	242	920210	223052.30	60	0	0	0	0	0	F	F	F	F	12	NO
11690	232	920211	092047.21	60	0	0	0	0	0	F	F	F	F	12	NO
12388	329	920211	145431.02	0	0	0	54	100	0	T	F	F	F	12	NO
4515	396	920211	061147.69	60	50	24	7	50	0	F	F	F	F	11	NO
19541	232	920211	084751.73	60	59	0	0	0	0	F	F	F	F	11	NO
12120	242	920210	225629.64	60	19	0	0	0	0	F	F	F	F	11	NO
12993	232	920211	083244.24	60	59	0	6	25	0	F	F	F	F	11	NO
4612	221	920210	211936.45	0	28	87	8	0	0	F	F	F	F	11	NO

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11708	242	920210	223052.30	60	44	0	0	0	0	F	F	F	F	11	NO
11622	242	920210	230559.01	60	70	0	0	0	0	F	F	F	F	11	NO
6779	398	920207	072808.50	80	35	32	0	20	0	F	F	T	F	11	NO
11622	242	920210	230912.44	60	70	0	0	0	0	F	F	F	F	11	NO
3292	232	920211	083818.91	60	50	0	0	0	0	F	F	F	F	11	NO
1716	222	920210	201818.77	0	40	77	23	0	0	F	F	F	F	11	NO
13554	242	920210	230244.97	60	16	0	0	0	0	F	F	F	F	11	NO
17670	399	920210	205651.27	20	0	0	27	50	0	F	F	F	F	11	NO
13554	242	920210	232656.94	60	15	0	0	0	0	F	F	F	F	11	NO
15679	241	920211	175728.50	60	22	0	0	0	0	F	F	F	F	11	NO
11622	242	920210	230244.97	60	69	0	0	0	0	F	F	F	F	11	NO
13554	242	920210	230912.44	60	15	0	0	0	0	F	F	F	F	11	NO
13554	242	920210	230559.01	60	15	0	0	0	0	F	F	F	F	11	NO
11145	242	920210	223052.30	60	59	0	0	0	0	F	F	F	F	11	NO
11145	242	920210	223358.66	60	59	0	0	0	0	F	F	F	F	11	NO
10453	396	920211	182408.83	20	0	0	29	50	0	F	F	F	F	11	NO
14783	242	920210	225302.73	60	46	0	0	0	0	F	F	F	F	11	NO
16396	242	920210	223052.30	60	42	0	0	0	0	F	F	F	F	11	NO
88111	241	920211	172857.63	60	52	0	0	0	0	F	F	F	F	11	NO
88111	242	920211	174036.02	60	60	0	0	0	0	F	F	F	F	11	NO
88111	242	920210	224108.97	60	37	0	0	0	0	F	F	F	F	11	NO
11622	242	920210	225947.88	60	69	0	0	0	0	F	F	F	F	11	NO
13554	243	920211	195321.20	60	48	0	0	0	0	F	F	F	F	11	NO
88111	241	920211	175726.50	60	60	0	0	0	0	F	F	F	F	11	NO
19993	329	920211	035432.62	0	0	0	46	100	0	T	F	F	F	11	NO
20258	232	920211	084459.95	60	24	0	0	0	0	F	F	F	F	11	NO
10541	396	920211	061207.43	20	62	0	65	100	0	F	F	F	T	11	NO
88111	241	920211	173159.75	60	56	0	0	0	0	F	F	F	F	11	NO
13177	242	920210	225629.64	40	93	0	0	0	0	F	F	F	F	10	NO
21835	396	920211	061450.98	20	96	28	24	0	0	F	F	F	F	10	NO
14591	242	920210	223358.66	40	0	0	0	33	0	F	F	F	F	10	NO
14086	242	920210	232721.32	40	97	6	2	0	0	F	F	F	F	10	NO
21869	329	920211	170643.38	0	32	0	54	100	0	T	F	F	F	10	NO
13648	232	920211	091202.36	0	68	80	0	0	0	F	F	F	F	10	NO
17128	231	920211	064928.93	20	97	60	8	50	0	F	F	F	F	10	NO
13554	242	920210	224923.21	40	0	0	15	0	0	F	F	F	F	10	NO
11269	396	920211	020456.34	40	0	0	0	0	0	F	F	F	F	9	NO
15916	242	920211	173743.47	40	0	0	0	0	0	F	F	F	F	9	NO
14524	399	920211	110935.35	40	85	52	0	33	0	F	F	F	F	9	NO
17000	241	920211	172952.42	20	17	0	36	50	0	F	F	F	F	9	NO
15935	329	920211	064807.63	0	0	0	38	100	0	T	F	F	F	9	NO
7324	242	920210	224954.97	40	87	0	0	0	0	F	F	F	F	9	NO
18549	221	920210	211939.45	0	24	77	0	0	0	F	F	F	F	9	NO
21390	329	920211	193756.79	0	0	0	38	100	0	T	F	F	F	9	NO
11765	329	920211	032423.85	0	0	0	38	100	0	T	F	F	F	9	NO
17333	232	920211	093927.84	40	0	0	0	0	0	F	F	F	F	9	NO
20674	388	920211	072931.29	40	0	0	0	0	0	F	F	F	F	9	NO
3569	232	920211	075205.23	20	33	48	48	50	0	F	F	F	F	9	NO
10882	329	920211	075245.98	0	0	0	31	100	0	T	F	F	F	8	NO
13738	329	920211	121911.27	0	0	0	31	100	0	T	F	F	F	8	NO
20559	222	920210	200459.89	20	0	0	0	50	0	F	F	F	F	8	NO
15916	241	920211	173725.84	20	0	0	0	50	0	F	F	F	F	8	NO
20704	232	920211	090056.60	20	0	0	0	50	0	F	F	F	F	8	NO
20258	232	920211	085524.11	60	88	0	0	0	0	F	F	F	T	8	NO
14528	383	920211	131850.04	20	0	0	3	50	0	F	F	F	F	8	NO
8593	329	920211	201916.29	0	0	0	31	100	0	T	F	F	F	8	NO
5760	329	920211	040413.99	0	72	10	46	100	0	T	F	F	F	8	NO
4862	329	920211	081128.50	0	0	0	31	100	0	T	F	F	F	8	NO
15530	396	920211	035934.63	40	71	0	0	0	0	F	F	F	F	8	NO
20082	232	920211	083330.45	20	99	0	0	0	0	F	F	F	F	8	NO
17665	396	920211	041232.53	40	53	0	25	33	0	F	F	F	F	8	NO
3555	329	920211	003102.63	0	0	0	31	100	0	T	F	F	F	8	NO
15836	399	920211	055820.39	20	0	0	0	50	0	F	F	F	F	8	NO
1589	241	920211	174633.88	40	85	11	9	33	0	F	F	F	F	8	NO

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750	242	920210	230244.97	20	82	0	36	50	0	F	F	F	F	8	NO
10614	329	920211	000514.37	0	0	0	31	100	0	T	F	F	F	8	NO
20262	396	920211	205718.99	20	0	0	0	50	0	F	F	F	F	8	NO
81061	396	920211	065634.61	20	0	0	0	50	0	F	F	F	F	8	NO
10569	232	920211	073534.40	20	0	0	0	50	0	F	F	F	F	8	NO
14410	396	920211	095954.57	20	15	0	10	50	0	F	F	F	F	7	NO
12295	399	920211	112917.85	20	0	0	0	0	0	F	F	F	F	7	NO
14131	232	920211	052037.05	20	45	55	0	0	0	F	F	F	F	7	NO
17333	233	920211	094223.80	20	0	0	0	0	0	F	F	F	F	7	NO
14512	232	920211	094315.63	0	0	0	23	0	0	F	F	F	F	7	NO
13904	243	920211	185858.68	20	92	0	0	0	0	F	F	F	F	7	NO
88057	398	920206	150321.55	0	0	0	23	0	0	F	F	F	F	7	NO
16987	242	920211	175917.69	20	91	50	5	50	0	F	F	F	F	7	NO
87390	399	920211	153334.38	0	0	0	23	0	0	F	F	F	F	7	NO
87383	385	920211	113638.86	20	0	0	0	0	0	F	F	F	F	7	NO
88066	398	920122	075031.28	0	76	57	15	0	0	F	F	F	F	7	NO
88895	243	920211	185858.68	40	97	75	0	0	0	F	F	F	T	7	NO
12347	396	920211	205718.99	0	0	0	23	0	0	F	F	F	F	7	NO
14913	396	920211	205758.46	0	0	0	23	0	0	F	F	F	F	7	NO
1808	390	920211	061511.19	0	0	0	23	0	0	F	F	F	F	7	NO
1583	393	920211	145023.30	0	0	0	23	0	0	F	F	F	F	7	NO
20131	396	920116	052633.12	0	0	0	23	0	0	F	F	F	F	7	NO
10212	399	920211	135429.55	0	0	0	23	0	0	F	F	F	F	7	NO
21390	232	620211	052356.69	0	0	0	23	0	0	F	F	F	F	7	NO
229	398	920208	094403.72	0	0	0	23	0	0	F	F	F	F	7	NO
20572	399	920211	000143.45	0	0	0	23	0	0	F	F	F	F	7	NO
19948	399	920211	223435.15	0	0	0	23	0	0	F	F	F	F	7	NO
21623	385	920211	090427.59	20	6	31	0	50	0	F	F	F	F	7	NO
21859	241	920211	174443.66	20	47	0	40	50	0	F	F	F	F	7	NO
2976	396	920211	035954.40	0	0	0	23	0	0	F	F	F	F	7	NO
1613	398	920207	072845.71	0	0	0	23	0	0	F	F	F	F	7	NO
21181	232	920211	065941.67	60	41	0	43	75	0	F	F	F	T	7	NO
21869	395	920211	105114.03	0	0	0	23	0	0	F	F	F	F	7	NO
2976	396	920211	041012.56	20	0	0	0	0	0	F	F	F	F	7	NO
3553	396	920211	195236.22	0	0	0	23	0	0	F	F	F	F	7	NO
7337	398	920208	120845.65	0	0	0	23	0	0	F	F	F	F	7	NO
21164	232	920211	084216.45	0	0	0	23	0	0	F	F	F	F	7	NO
17359	396	920211	194036.11	0	0	0	23	0	0	F	F	F	F	7	NO
10960	393	920211	191146.42	0	0	0	23	0	0	F	F	F	F	7	NO
19380	232	920211	083818.91	40	37	0	0	0	0	F	F	F	F	7	NO
20578	398	920206	095138.79	0	96	0	15	0	0	F	F	F	F	7	NO
3811	393	920211	191315.07	0	0	0	23	0	0	F	F	F	F	7	NO
9503	242	920210	224446.40	20	97	0	0	0	0	F	F	F	F	7	NO
9795	396	920211	033904.59	0	0	0	23	0	0	F	F	F	F	7	NO
6828	232	920211	073559.85	20	0	0	0	0	0	F	F	F	F	7	NO
4231	232	920211	065701.25	0	0	47	0	0	0	F	F	F	F	7	NO
4820	399	920211	171425.97	0	0	0	23	0	0	F	F	F	F	7	NO
12720	396	920211	061147.69	0	0	0	23	0	0	F	F	F	F	7	NO
15529	396	920211	035934.63	40	38	0	0	0	0	F	F	F	F	7	NO
12333	222	920210	200639.51	0	0	0	23	0	0	F	F	F	F	7	NO
21870	393	920211	105114.03	0	0	0	23	0	0	F	F	F	F	7	NO
10346	399	920211	124642.45	0	0	0	23	0	0	F	F	F	F	7	NO
10212	399	920211	154334.42	0	0	0	23	0	0	F	F	F	F	7	NO
11622	242	920210	223733.02	40	56	0	0	0	0	F	F	F	F	7	NO
12295	369	920211	200107.59	20	0	0	0	0	0	F	F	F	F	7	NO
15392	385	920211	113658.87	0	0	0	23	0	0	F	F	F	F	7	NO
10198	242	920211	175847.64	0	0	0	23	0	0	F	F	F	F	7	NO
21678	399	920211	111637.67	0	0	0	23	0	0	F	F	F	F	7	NO
21819	232	920211	100911.49	0	0	0	8	0	0	F	F	F	F	6	NO
18565	382	920211	113026.17	0	0	0	15	0	0	F	F	F	F	6	NO
19318	396	920211	033025.09	0	0	0	8	0	0	F	F	F	F	6	NO
21839	222	920210	200554.17	0	0	0	15	0	0	F	F	F	F	6	NO
19437	329	920211	225736.68	0	36	0	38	100	0	T	F	F	F	6	NO

SAT	SNSR	DATE	TIME	OBS	U	V	W	W>10	ID	FH	HALO	AGE	σ	RANK	EXPERT
12731	396	920211	194036.11	0	0	0	15	0	0	F	F	F	F	6	NO
13878	242	920211	175006.70	0	100	0	0	0	0	F	F	F	F	6	NO
3432	232	920211	091752.36	20	83	0	0	0	0	F	F	F	F	6	NO
3932	396	920211	064931.36	0	0	0	15	0	0	F	F	F	F	6	NO
13878	242	920211	174354.95	0	100	0	0	0	0	F	F	F	F	6	NO
1806	396	920211	064921.49	20	6	0	0	0	0	F	F	F	F	6	NO
20586	231	920211	075840.02	40	60	0	0	33	0	F	F	F	F	6	NO
18415	396	920211	122444.75	20	53	54	0	0	0	F	F	F	F	6	NO
3343	399	920211	111646.93	0	0	0	15	0	0	F	F	F	F	6	NO
21834	398	920210	093716.01	20	67	0	18	0	0	F	F	F	F	6	NO
21152	398	920205	130558.03	0	0	0	8	0	0	F	F	F	F	6	NO
20775	393	920211	183000.53	0	0	0	8	0	0	F	F	F	F	6	NO
12054	398	920115	235238.80	0	0	0	15	0	0	F	F	F	F	6	NO
11708	242	920210	223356.66	40	44	0	3	33	0	F	F	F	F	6	NO
20261	393	920211	182730.53	0	0	0	15	0	0	F	F	F	F	6	NO
10626	398	920128	233141.60	0	0	0	8	0	0	F	F	F	F	6	NO
19993	396	920211	041232.53	20	81	0	0	0	0	F	F	F	F	6	NO
17181	334	920211	090453.32	0	0	0	8	0	0	F	F	F	F	6	NO
17698	398	920207	072820.65	0	0	0	15	0	0	F	F	F	F	6	NO
15938	398	920208	094731.68	0	0	0	15	0	0	F	F	F	F	6	NO
2435	399	920211	113545.63	0	0	0	15	0	0	F	F	F	F	6	NO
21491	399	920211	121422.99	0	0	0	8	0	0	F	F	F	F	6	NO
18693	399	920211	171026.39	0	0	0	8	0	0	F	F	F	F	6	NO
19170	404	920211	041535.20	20	12	0	0	0	0	F	F	F	F	6	NO
17130	329	920211	003102.63	0	56	0	38	100	0	T	F	F	F	6	NO
18779	232	920211	083330.45	0	0	0	8	0	0	F	F	F	F	6	NO
10202	399	920211	021535.47	0	0	0	15	0	0	F	F	F	F	6	NO
324	396	920213	100130.79	0	0	0	15	0	0	F	F	F	F	6	NO
9829	232	920211	073938.33	20	83	0	0	0	0	F	F	F	F	6	NO
3560	399	920211	135429.55	0	0	0	15	0	0	F	F	F	F	6	NO
87207	233	920211	094501.10	0	96	20	0	0	0	F	F	F	F	6	NO
4856	385	920124	052920.50	0	0	0	15	0	0	F	F	F	F	6	NO
739	232	920211	051429.24	0	0	0	8	0	0	F	F	F	F	6	NO
8084	396	920122	120013.03	40	0	0	69	100	0	F	F	T	F	6	NO
7851	393	920211	215900.43	0	0	0	8	0	0	F	F	F	F	6	NO
88033	231	920211	103545.78	100	69	0	0	25	0	F	F	T	T	6	NO
88076	398	920211	085725.14	0	0	0	15	0	0	F	F	F	F	6	NO
14925	399	920211	031835.67	0	0	0	8	0	0	F	F	F	F	6	NO
11	398	920209	120409.88	0	0	0	15	0	0	F	F	F	F	6	NO
14839	399	920211	051618.88	0	0	0	8	0	0	F	F	F	F	6	NO
14483	231	920211	103954.72	0	0	0	15	0	0	F	F	F	F	6	NO
10519	398	920126	220347.36	0	0	0	15	0	0	F	F	F	F	6	NO
88848	398	920209	024650.96	0	0	0	15	0	0	F	F	F	F	6	NO
14478	232	920211	091049.88	0	84	47	0	0	0	F	F	F	F	6	NO
5197	399	920211	031524.53	0	0	0	15	0	0	F	F	F	F	6	NO
5242	242	920210	230113.87	20	72	31	52	50	0	F	F	F	F	6	NO
13757	398	920208	120547.77	0	0	0	8	0	0	F	F	F	F	6	NO
10659	395	920210	223518.82	0	0	0	8	0	0	F	F	F	F	6	NO
6752	396	920211	175606.24	0	0	0	15	0	0	F	F	F	F	6	NO
10470	399	920211	204343.29	0	0	0	8	0	0	F	F	F	F	6	NO
7376	334	920211	034516.97	100	0	0	0	0	0	F	F	F	T	6	NO
5763	390	920211	224607.33	0	0	0	8	0	0	F	F	F	F	6	NO
7488	398	920129	235511.74	0	0	0	15	0	0	F	F	F	F	6	NO
4330	385	920211	113648.71	0	0	0	8	0	0	F	F	F	F	6	NO
9951	398	920129	235638.11	0	0	0	8	0	0	F	F	F	F	6	NO
13878	241	920213	174726.68	0	100	0	0	0	0	F	F	F	F	6	NO
7842	398	920210	093716.01	0	88	0	15	0	0	F	F	F	F	6	NO
13878	241	920211	174508.59	0	100	0	0	0	0	F	F	F	F	6	NO
12330	393	920211	125935.77	0	0	0	0	0	0	F	F	F	F	5	NO
88847	382	920211	081010.75	0	0	0	0	0	0	F	F	F	F	5	NO
18512	399	920211	154408.01	0	0	0	0	0	0	F	F	F	F	5	NO
12733	398	920208	050624.96	0	0	0	0	0	0	F	F	F	F	5	NO
19106	398	920205	130741.94	0	0	0	0	0	0	F	F	F	F	5	NO
19136	232	920211	101116.87	0	0	0	0	0	0	F	F	F	F	5	NO

SAT	SNSR	DATE	TIME	OBS	U	V	W	W>10	ID	FH	HALO	AGE	σ	RANK	EXPERT
12644	398	920122	075031.28	0	0	0	0	0	0	F	F	F	F	5	NO
12897	404	920210	203832.62	0	0	0	0	0	0	F	F	F	F	5	NO
13073	396	920211	100014.31	0	0	0	0	0	0	F	F	F	F	5	NO
13458	399	920211	060733.76	0	0	0	0	0	0	F	F	F	F	5	NO
10476	399	920211	143905.62	0	0	0	0	0	0	F	F	F	F	5	NO
18864	399	920211	031423.87	0	0	0	0	0	0	F	F	F	F	5	NO
10269	232	920211	091904.06	0	0	0	0	0	0	F	F	F	F	5	NO
11028	231	920211	075734.75	0	0	0	0	0	0	F	F	F	F	5	NO
21859	241	920211	173725.84	0	0	0	0	0	0	F	F	F	F	5	NO
21860	399	920211	225929.42	0	0	0	0	0	0	F	F	F	F	5	NO
14556	399	920211	171336.64	0	0	0	0	0	0	F	F	F	F	5	NO
14467	396	920211	184253.95	0	0	0	0	0	0	F	F	F	F	5	NO
14978	242	920210	225947.88	0	0	0	0	0	0	F	F	F	F	5	NO
14910	396	920211	100130.79	0	0	0	0	0	0	F	F	F	F	5	NO
15053	393	920211	130111.60	0	0	0	0	0	0	F	F	F	F	5	NO
14608	232	920211	050948.16	0	0	0	0	0	0	F	F	F	F	5	NO
14445	399	920211	004827.72	0	0	0	0	0	0	F	F	F	F	5	NO
14420	242	920210	224225.01	0	0	0	0	0	0	F	F	F	F	5	NO
14565	399	920211	133658.51	0	0	0	0	0	0	F	F	F	F	5	NO
10659	222	920210	201619.90	0	0	0	0	0	0	F	F	F	F	5	NO
21686	396	920211	041302.14	0	0	0	0	0	0	F	F	F	F	5	NO
18997	241	920211	175726.50	0	0	0	0	0	0	F	F	F	F	5	NO
18589	232	920211	073121.06	0	0	0	0	0	0	F	F	F	F	5	NO
19006	399	920211	142551.88	0	0	0	0	0	0	F	F	F	F	5	NO
88856	399	920211	133615.76	0	0	0	0	0	0	F	F	F	F	5	NO
19293	399	920211	044449.29	0	0	0	0	0	0	F	F	F	F	5	NO
19396	398	920210	093807.19	0	0	0	0	0	0	F	F	F	F	5	NO
12979	383	920211	144346.45	0	0	0	0	0	0	F	F	F	F	5	NO
18589	232	920211	073142.81	0	0	0	0	0	0	F	F	F	F	5	NO
21446	396	920211	104746.33	0	0	0	0	0	0	F	F	F	F	5	NO
21620	221	920211	144114.03	0	0	0	0	0	0	F	F	F	F	5	NO
21660	399	920211	131426.94	0	0	0	0	0	0	F	F	F	F	5	NO
21565	398	920206	095345.03	0	0	0	0	0	0	F	F	F	F	5	NO
21523	222	920210	200720.38	0	0	0	0	0	0	F	F	F	F	5	NO
21448	399	920211	111637.67	0	0	0	0	0	0	F	F	F	F	5	NO
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21461	382	920211	113026.17	0	0	0	0	0	0	F	F	F	F	5	NO
3783	232	920211	051401.39	0	0	0	0	0	0	F	F	F	F	5	NO
18511	393	920211	190907.62	0	0	0	0	0	0	F	F	F	F	5	NO
58	398	920206	050941.81	0	0	0	0	0	0	F	F	F	F	5	NO
2222	232	920211	083534.22	0	0	0	0	0	0	F	F	F	F	5	NO
21340	398	920128	233002.62	0	0	0	0	0	0	F	F	F	F	5	NO
3173	393	920211	122819.47	0	0	0	0	0	0	F	F	F	F	5	NO
21339	399	920211	223152.10	0	0	0	0	0	0	F	F	F	F	5	NO
20572	369	920211	125102.11	0	0	0	0	0	0	F	F	F	F	5	NO
2481	231	920213	103954.72	0	4	0	0	0	0	F	F	F	F	5	NO
720	396	920211	205718.99	0	0	0	0	0	0	F	F	F	F	5	NO
20333	399	920211	110649.27	0	0	0	0	0	0	F	F	F	F	5	NO
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3699	393	920211	131148.50	0	0	0	0	0	0	F	F	F	F	5	NO
20559	221	920210	205543.87	0	0	0	0	0	0	F	F	F	F	5	NO
14694	383	920211	202057.32	0	0	0	0	0	0	F	F	F	F	5	NO
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20572	369	920211	125102.11	0	0	0	0	0	0	F	F	F	F	5	NO
3343	399	920211	111025.10	0	0	0	0	0	0	F	F	F	F	5	NO
21011	369	920211	023152.07	0	0	0	0	0	0	F	F	F	F	5	NO
21137	398	920209	024851.13	0	0	0	0	0	0	F	F	F	F	5	NO
4738	232	920211	051116.85	0	92	10	8	0	0	F	F	F	F	5	NO
21049	369	920211	175348.96	0	0	0	0	0	0	F	F	F	F	5	NO
21058	398	920209	120544.80	0	0	0	0	0	0	F	F	F	F	5	NO
21049	369	920211	175348.96	0	0	0	0	0	0	F	F	F	F	5	NO
20572	369	920211	125242.03	0	0	0	0	0	0	F	F	F	F	5	NO
4594	396	920211	012805.72	0	0	0	0	0	0	F	F	F	F	5	NO
21318	232	920211	060157.17	0	0	0	0	0	0	F	F	F	F	5	NO

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21250	232	920211	090006.51	0	0	0	0	0	0	F	F	F	F	5	NO
196	398	920112	212622.32	0	0	0	0	0	0	F	F	F	F	5	NO
20572	369	920211	125204.88	0	0	0	0	0	0	F	F	F	F	5	NO
3818	398	920205	130741.94	0	76	0	23	0	0	F	F	F	F	5	NO
21196	232	920211	083534.22	0	0	0	0	0	0	F	F	F	F	5	NO
3592	396	920211	122444.75	0	0	0	0	0	0	F	F	F	F	5	NO
20308	393	920211	191058.55	0	0	0	0	0	0	F	F	F	F	5	NO
18279	221	920210	211939.45	0	0	0	0	0	0	F	F	F	F	5	NO
18946	242	920211	180017.19	0	0	0	0	0	0	F	F	F	F	5	NO
18257	396	920211	175645.72	0	0	0	0	0	0	F	F	F	F	5	NO
88888	242	920210	225302.73	0	0	0	0	0	0	F	F	F	F	5	NO
16396	242	920210	225805.88	0	0	0	0	0	0	F	F	F	F	5	NO
88922	399	920211	044449.29	0	0	0	0	0	0	F	F	F	F	5	NO
18467	393	920211	191058.55	0	0	0	0	0	0	F	F	F	F	5	NO
17754	393	920211	182853.30	0	0	0	0	0	0	F	F	F	F	5	NO
88737	242	920211	173530.30	0	0	0	0	0	0	F	F	F	F	5	NO
17216	399	920211	123304.12	0	0	0	0	0	0	F	F	F	F	5	NO
17130	399	920211	031640.59	0	0	0	0	0	0	F	F	F	F	5	NO
16953	399	920211	080552.99	0	0	0	0	0	0	F	F	F	F	5	NO
17481	399	920204	215632.71	0	76	0	23	0	0	F	F	F	F	5	NO
16939	334	920211	125157.84	0	0	0	0	0	0	F	F	F	F	5	NO
88788	385	920211	223247.69	0	0	0	0	0	0	F	F	F	F	5	NO
16391	396	920211	205728.86	0	0	0	0	0	0	F	F	F	F	5	NO
15789	399	920211	203800.34	0	0	0	0	0	0	F	F	F	F	5	NO
19952	398	920208	120622.29	0	0	0	0	0	0	F	F	F	F	5	NO
19877	398	920206	143035.10	0	0	0	0	0	0	F	F	F	F	5	NO
20123	334	920211	165652.54	20	29	0	0	50	0	F	F	F	F	5	NO
20129	221	920210	211856.51	0	0	0	0	0	0	F	F	F	F	5	NO
20282	383	920211	144236.15	0	0	0	0	0	0	F	F	F	F	5	NO
20281	221	920210	202258.95	0	0	0	0	0	0	F	F	F	F	5	NO
15555	393	920211	191315.07	0	0	0	0	0	0	F	F	F	F	5	NO
19659	398	920206	095138.79	0	0	0	0	0	0	F	F	F	F	5	NO
16390	399	920211	080708.77	0	0	0	0	0	0	F	F	F	F	5	NO
16229	399	920211	110625.25	0	0	0	0	0	0	F	F	F	F	5	NO
15741	385	920211	090946.74	0	0	0	0	0	0	F	F	F	F	5	NO
19608	399	920211	031726.20	0	0	0	0	0	0	F	F	F	F	5	NO
15267	232	920211	050842.67	0	0	0	0	0	0	F	F	F	F	5	NO
1806	396	920211	065634.61	20	73	0	0	0	0	F	F	F	F	5	NO
15680	242	920210	224446.40	0	0	0	0	0	0	F	F	F	F	5	NO
5685	399	920211	080758.15	0	0	0	0	0	0	F	F	F	F	5	NO
9921	231	920211	064649.66	0	92	0	0	0	0	F	F	F	F	5	NO
10629	398	920209	024650.96	0	0	0	0	0	0	F	F	F	F	5	NO
10365	242	920230	230559.01	0	0	0	0	0	0	F	F	F	F	5	NO
10262	399	920211	220531.05	0	0	0	0	0	0	F	F	F	F	5	NO
21552	241	920211	173159.75	0	0	0	0	0	0	F	F	F	F	5	NO
21635	334	920211	165652.54	20	77	0	0	50	0	F	F	F	F	5	NO
10436	395	920210	223448.82	0	0	0	0	0	0	F	F	F	F	5	NO
10252	232	920211	091049.88	0	0	0	0	0	0	F	F	F	F	5	NO
12694	399	920211	051519.34	0	0	0	0	0	0	F	F	F	F	5	NO
12497	398	920206	150321.55	0	0	3	0	0	0	F	F	F	F	5	NO
12445	398	920208	050819.64	0	0	0	0	0	0	F	F	F	F	5	NO
12295	399	920211	113622.28	0	0	0	0	0	0	F	F	F	F	5	NO
13390	232	920211	083352.26	0	0	0	0	0	0	F	F	F	F	5	NO
13503	398	920208	094840.97	0	0	0	0	0	0	F	F	F	F	5	NO
12102	399	920113	055312.35	80	0	0	0	0	100	F	F	T	F	5	NO
10837	242	920210	223225.69	0	0	0	0	0	0	F	F	F	F	5	NO
88025	398	920122	075031.28	0	0	0	0	0	0	F	F	F	F	5	NO
87568	399	920211	051807.34	0	0	0	0	0	0	F	F	F	F	5	NO
87403	222	920211	121038.61	0	0	0	0	0	0	F	F	F	F	5	NO
87338	232	920211	083843.59	0	0	0	0	0	0	F	F	F	F	5	NO
87328	232	920211	092159.30	0	0	0	0	0	0	F	F	F	F	5	NO
87855	399	920211	051730.95	0	0	0	0	0	0	F	F	F	F	5	NO
87660	232	920211	084538.84	0	0	0	0	0	0	F	F	F	F	5	NO

SAT	SNSR	DATE	TIME	OBS	U	V	W	W>10	ID	FH	HALO	AGE	σ	RANK	EXPERT
10629	399	920210	235556.63	0	0	0	0	0	0	F	F	F	F	5	NO
10894	398	920209	023857.23	0	0	0	0	0	0	F	F	F	F	5	NO
21723	399	920211	203747.63	0	0	0	0	0	0	F	F	F	F	5	NO
12959	398	920204	143907.98	0	0	0	0	0	0	F	F	F	F	5	NO
12698	232	920211	101116.87	0	0	0	0	0	0	F	F	F	F	5	NO
12849	399	920211	174723.14	0	88	0	0	0	0	F	F	F	F	5	NO
12959	398	920209	024051.34	0	0	0	0	0	0	F	F	F	F	5	NO
21404	232	920211	051401.39	0	0	0	0	0	0	F	F	F	F	5	NO
10184	385	920210	234322.80	0	0	0	0	0	0	F	F	F	F	5	NO
9982	242	920210	230431.24	0	0	0	0	0	0	F	F	F	F	5	NO
10010	398	920129	235410.28	0	0	0	0	0	0	F	F	F	F	5	NO
10144	399	920211	152506.47	0	0	0	0	0	0	F	F	F	F	5	NO
10013	363	920211	131940.26	0	0	0	0	0	0	F	F	F	F	5	NO
9962	399	920211	101933.53	0	0	0	0	0	0	F	F	F	F	5	NO
9951	399	920211	102022.85	0	0	0	0	0	0	F	F	F	F	5	NO
8302	399	920211	031835.67	0	0	0	0	0	0	F	F	F	F	5	NO
8405	398	920206	145927.72	0	0	0	0	0	0	F	F	F	F	5	NO
7850	393	920211	182446.10	0	0	0	0	0	0	F	F	F	F	5	NO
7943	399	920211	011211.40	0	0	0	0	0	0	F	F	F	F	5	NO
8159	396	920211	122444.75	0	0	0	0	0	0	F	F	F	F	5	NO
8133	398	920129	235803.60	0	0	0	0	0	0	F	F	F	F	5	NO
88847	399	920211	080706.10	0	88	0	0	0	0	F	F	F	F	5	NO
88812	399	920211	135503.63	0	0	0	0	0	0	F	F	F	F	5	NO
13016	242	920210	232656.94	20	73	0	0	0	0	F	F	F	F	5	NO
14416	398	920128	233002.62	0	0	0	0	0	0	F	F	F	F	5	NO
12987	232	920211	051116.85	0	4	0	0	0	0	F	F	F	F	5	NO
10211	398	920200	095345.03	0	0	0	0	0	0	F	F	F	F	5	NO
21452	395	920210	223618.82	0	0	0	0	0	0	F	F	F	F	5	NO
88737	242	920211	173743.47	0	92	0	0	0	0	F	F	F	F	5	NO
88788	399	920211	031726.25	0	0	0	0	0	0	F	F	F	F	5	NO
88933	232	920211	100816.72	0	0	0	0	0	0	F	F	F	F	5	NO
88868	388	920211	072951.39	0	0	0	0	0	0	F	F	F	F	5	NO
88917	398	920205	025353.20	0	0	0	0	0	0	F	F	F	F	5	NO
88884	398	920204	110819.68	0	0	0	0	0	0	F	F	F	F	5	NO
88764	399	920208	211808.34	0	0	0	0	0	0	F	F	F	F	5	NO
88919	399	920211	220531.05	0	0	0	0	0	0	F	F	F	F	5	NO
87351	398	920209	151846.06	0	0	0	0	0	0	F	F	F	F	5	NO
87380	398	920210	094052.78	0	0	0	0	0	0	F	F	F	F	5	NO
1808	399	920211	171401.23	0	0	0	0	0	0	F	F	F	F	5	NO
1312	396	920210	235934.85	0	0	0	0	0	0	F	F	F	F	5	NO
655	232	920211	091049.88	0	0	0	0	0	0	F	F	F	F	5	NO
2353	393	920211	224222.40	0	0	0	0	0	0	F	F	F	F	5	NO
1576	398	920205	025047.47	0	0	0	0	0	0	F	F	F	F	5	NO
558	399	920211	113747.66	0	0	0	0	0	0	F	F	F	F	5	NO
21324	399	920211	101030.77	0	0	0	0	0	0	F	F	F	F	5	NO
3292	232	920211	083534.22	0	0	0	0	0	0	F	F	F	F	5	NO
3713	399	920211	100951.00	0	0	0	0	0	0	F	F	F	F	5	NO
20572	369	920211	125204.88	0	0	0	0	0	0	F	F	F	F	5	NO
4178	393	920211	182853.30	0	0	0	0	0	0	F	F	F	F	5	NO
3094	399	920231	051618.88	0	0	0	0	0	0	F	F	F	F	5	NO
20572	369	920211	125242.03	0	0	0	0	0	0	F	F	F	F	5	NO
45	393	920211	224415.30	0	0	0	0	0	0	F	F	F	F	5	NO
133	232	920211	092159.30	0	0	0	0	0	0	F	F	F	F	5	NO
3555	399	920211	111558.36	0	0	0	0	0	0	F	F	F	F	5	NO
20330	385	920211	090946.74	0	0	0	0	0	0	F	F	F	F	5	NO
19995	398	920205	121100.27	0	0	0	0	0	0	F	F	F	F	5	NO
19574	233	920211	094223.80	0	0	0	0	0	0	F	F	F	F	5	NO
19771	398	920206	150119.14	0	0	0	0	0	0	F	F	F	F	5	NO
20307	396	920213	071938.63	0	0	0	0	0	0	F	F	F	F	5	NO
20258	232	920211	085815.60	40	97	0	0	0	0	F	F	F	T	5	NO
2685	398	920123	042117.61	0	0	0	0	0	0	F	F	F	F	5	NO
12	398	920131	192541.67	0	0	0	0	0	0	F	F	F	F	5	NO
2092	398	920206	145927.72	0	0	0	0	0	0	F	F	F	F	5	NO
2337	232	920211	094315.63	0	0	0	0	0	0	F	F	F	F	5	NO

SAT	SNSR	DATE	TIME	OBS	U	V	W	W>10	ID	FH	HALO	AGE	σ	RANK	EXPERT
3670	398	920208	132630.42	0	0	0	0	0	0	F	F	F	F	5	NO
20406	242	920210	224624.95	0	0	0	0	0	0	F	F	F	F	5	NO
3267	398	920205	121901.77	0	0	0	0	0	0	F	F	F	F	5	NO
20572	369	920211	125034.71	0	0	0	0	0	0	F	F	F	F	5	NO
88056	385	920124	052920.50	0	0	0	0	0	0	F	F	F	F	5	NO
88061	399	920211	041108.28	0	0	0	0	0	0	F	F	F	F	5	NO
88065	399	920211	112934.68	0	0	0	0	0	0	F	F	F	F	5	NO
87308	390	920211	081725.53	0	0	0	0	0	0	F	F	F	F	5	NO
87308	396	920211	081735.39	20	68	0	13	0	0	F	F	F	F	5	NO
88045	398	920201	003122.15	0	0	0	0	0	0	F	F	F	F	5	NO
88074	242	920211	175401.07	0	0	0	0	0	0	F	F	F	F	5	NO
88034	383	920211	025459.73	0	0	0	0	0	0	F	F	F	F	5	NO
88028	398	920205	025953.06	0	0	0	0	0	0	F	F	F	F	5	NO
88102	399	920113	055509.31	0	0	0	0	0	0	F	F	F	F	5	NO
88127	398	920121	012425.76	0	0	0	0	0	0	F	F	F	F	5	NO
88076	398	920119	172158.36	0	0	0	0	0	0	F	F	F	F	5	NO
88454	369	920211	043121.74	0	0	0	0	0	0	F	F	F	F	5	NO
87295	399	920211	110649.27	0	0	0	0	0	0	F	F	F	F	5	NO
87301	399	920211	225812.65	0	0	0	0	0	0	F	F	F	F	5	NO
155	393	920211	183000.53	0	0	0	0	0	0	F	F	F	F	5	NO
21211	232	920211	063534.22	0	0	0	0	0	0	F	F	F	F	5	NO
21013	369	920211	031136.06	0	0	0	0	0	0	F	F	F	F	5	NO
3492	232	920211	083244.24	0	0	0	0	0	0	F	F	F	F	5	NO
4613	399	920211	031835.67	0	0	0	0	0	0	F	F	F	F	5	NO
341	398	920207	120727.41	0	0	0	0	0	0	F	F	F	F	5	NO
21150	398	920208	120547.77	0	0	0	0	0	0	F	F	F	F	5	NO
4141	399	920211	080648.38	0	88	0	0	0	0	F	F	F	F	5	NO
87306	399	920201	222215.38	0	0	0	0	0	0	F	F	F	F	5	NO
21057	398	920209	120409.88	0	0	0	0	0	0	F	F	F	F	5	NO
3790	399	920203	220536.85	0	0	0	0	0	0	F	F	F	F	5	NO
3790	399	920204	215632.71	0	0	0	0	0	0	F	F	F	F	5	NO
3741	399	920211	011447.48	0	0	0	0	0	0	F	F	F	F	5	NO
13080	398	920208	215817.34	0	0	0	0	0	0	F	F	F	F	5	NO
6752	399	920211	135429.55	0	0	0	0	0	0	F	F	F	F	5	NO
5076	399	920211	015337.55	0	0	0	0	0	0	F	F	F	F	5	NO
5994	398	920129	235327.88	0	0	0	0	0	0	F	F	F	F	5	NO
5014	399	920211	204343.29	0	0	0	0	0	0	F	F	F	F	5	NO
4976	393	920213	182730.53	0	0	0	0	0	0	F	F	F	F	5	NO
5148	393	920211	224758.63	0	0	0	0	0	0	F	F	F	F	5	NO
5093	396	920211	184313.72	0	0	0	0	0	0	F	F	F	F	5	NO
4857	398	920210	094052.78	0	0	0	0	0	0	F	F	F	F	5	NO
6118	399	920211	015828.34	0	0	0	0	0	0	F	F	F	F	5	NO
6844	393	920211	190627.82	0	0	0	0	0	0	F	F	F	F	5	NO
6675	232	920211	092047.21	0	4	0	8	0	0	F	F	F	F	5	NO
6676	232	920211	084307.59	0	0	0	0	0	0	F	F	F	F	5	NO
6278	242	920210	231048.99	0	0	0	0	0	0	F	F	F	F	5	NO
6779	233	920211	094655.26	0	0	0	0	0	0	F	F	F	F	5	NO
7137	393	920211	191315.07	0	0	0	0	0	0	F	F	F	F	5	NO
7182	399	920211	051543.14	0	0	0	0	0	0	F	F	F	F	5	NO
6843	221	920210	211850.51	0	0	0	0	0	0	F	F	F	F	5	NO
5638	393	920211	224607.33	0	4	0	8	0	0	F	F	F	F	5	NO
5498	241	920211	174940.71	40	3	0	11	33	0	F	F	F	T	5	NO
13780	334	920211	131457.86	0	0	0	0	0	0	F	F	F	F	5	NO
15166	369	920211	180123.28	0	0	0	0	0	0	F	F	F	F	5	NO
13971	221	920210	211939.45	0	0	0	0	0	0	F	F	F	F	5	NO
14131	398	920129	235803.60	0	0	0	0	0	0	F	F	F	F	5	NO
14236	399	920211	055928.29	0	0	0	0	0	0	F	F	F	F	5	NO
13554	242	920211	175610.24	0	0	0	0	0	0	F	F	F	F	5	NO
13609	385	920124	052920.50	0	0	0	0	0	0	F	F	F	F	5	NO
15166	369	920211	180123.26	0	0	0	0	0	0	F	F	F	F	5	NO
15166	369	920211	180510.43	0	0	0	0	0	0	F	F	F	F	5	NO
88699	382	920211	081020.79	0	0	0	0	0	0	F	F	F	F	5	NO
88540	399	920211	011248.91	0	0	0	0	0	0	F	F	F	F	5	NO
15214	398	920205	121901.77	0	0	0	0	0	0	F	F	F	F	5	NO

SAT	SNSR	DATE	TIME	OBS	U	V	W	W>10	ID	FH	HALO	AGE	σ	RANK	EXPERT
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15166	369	920211	180510.43	0	0	0	0	0	0	F	F	F	F	5	NO
15166	369	920211	180316.94	0	0	0	0	0	0	F	F	F	F	5	NO
15166	369	920211	180316.94	0	0	0	0	0	0	F	F	F	F	5	NO
9795	399	920211	015700.30	0	0	0	0	0	0	F	F	F	F	5	NO
7780	398	920119	171712.01	0	0	0	0	0	0	F	F	F	F	5	NO
4841	232	920211	073846.40	0	0	0	0	0	0	F	F	F	F	5	NO
7794	399	920211	135603.88	0	0	0	0	0	0	F	F	F	F	5	NO
4759	384	920207	161921.30	0	0	0	0	0	0	F	F	F	F	5	NO
8513	242	920210	224923.21	0	0	0	0	0	0	F	F	F	F	5	NO
21656	745	920126	083727.69	0	48	50	0	0	0	F	F	F	F	4	NO
10198	241	920211	175828.40	20	70	0	12	50	0	F	F	F	F	4	NO
14167	232	920211	093948.48	20	59	0	0	0	0	F	F	F	F	4	NO
87980	398	920208	132444.34	0	16	0	0	0	0	F	F	F	F	4	NO
3825	232	920231	091839.88	0	52	0	23	0	0	F	F	F	F	4	NO
18241	396	920211	065558.62	20	32	0	0	50	0	F	F	F	F	4	NO
14825	222	920211	120805.44	20	52	0	0	0	0	F	F	F	F	4	NO
6846	242	920210	223052.30	0	24	0	8	0	0	F	F	F	F	4	NO
19150	745	920126	083727.69	0	36	0	15	0	0	F	F	F	F	4	NO
20129	398	920131	234032.22	0	80	0	0	0	0	F	F	F	F	4	NO
10445	385	920211	090645.29	20	41	0	0	0	0	F	F	F	F	4	NO
10449	242	920210	224554.37	20	88	38	17	50	0	F	F	F	F	4	NO
2997	221	920210	210416.94	0	28	0	15	0	0	F	F	F	F	4	NO
11353	242	920210	223900.67	0	76	0	0	0	0	F	F	F	F	4	NO
21338	399	920211	111745.94	0	12	0	0	0	0	F	F	F	F	4	NO
20258	232	620211	085851.19	0	76	0	0	0	0	F	F	F	F	4	NO
8145	393	920211	191146.42	0	76	0	0	0	0	F	F	F	F	4	NO
21819	396	920211	081725.53	40	92	49	38	100	0	F	F	T	F	4	NO
87308	396	920211	061450.98	20	30	0	0	0	0	F	F	F	F	4	NO
88934	222	920210	200459.89	0	68	0	15	0	0	F	F	F	F	4	NO
14900	222	920211	120229.50	0	32	0	8	0	0	F	F	F	F	3	NO
14699	232	920211	095438.82	0	28	0	0	0	0	F	F	F	F	3	NO
14568	242	920210	224624.95	0	24	0	0	0	0	F	F	F	F	3	NO
13574	222	920210	200221.59	0	40	0	8	0	0	F	F	F	F	3	NO
15935	329	920211	212117.31	40	79	0	36	67	0	T	F	F	F	3	NO
19051	232	920211	091904.06	0	20	0	0	0	0	F	F	F	F	3	NO
19105	241	920211	174508.59	0	32	0	0	0	0	F	F	F	F	3	NO
4119	231	920211	064813.17	0	60	0	0	0	0	F	F	F	F	3	NO
3681	396	920211	061501.05	0	24	0	0	0	0	F	F	F	F	3	NO
15764	399	920211	111706.68	0	52	0	0	0	0	F	F	F	F	3	NO
4191	232	920211	091839.88	0	20	0	0	0	0	F	F	F	F	3	NO
6938	383	920211	131840.00	0	64	0	8	0	0	F	F	F	F	3	NO
13814	231	920213	104125.83	0	48	0	0	0	0	F	F	F	F	3	NO
14086	242	920210	232656.94	0	32	0	0	0	0	F	F	F	F	3	NO
13024	384	920207	161911.26	0	52	0	0	0	0	F	F	F	F	3	NO
12786	398	920208	094258.60	0	44	0	0	0	0	F	F	F	F	3	NO
13459	396	920211	100402.07	0	56	0	0	0	0	F	F	F	F	3	NO
10599	396	920211	061511.19	0	60	0	0	0	0	F	F	F	F	3	NO
21196	334	920114	105316.72	0	24	0	0	0	0	F	F	F	F	3	NO
8181	399	920211	102122.78	0	44	0	0	0	0	F	F	F	F	3	NO
14503	383	920128	114546.87	0	48	0	0	0	0	F	F	F	F	3	NO
20055	334	920211	123849.23	0	28	0	0	0	0	F	F	F	F	3	NO
87210	232	920211	051646.07	0	48	0	0	0	0	F	F	F	F	3	NO
21128	232	920211	053635.68	60	25	30	0	25	0	F	F	F	T	2	NO
87346	329	920211	083930.42	0	80	83	8	0	0	T	F	F	F	2	NO
20258	232	920211	082926.77	60	0	0	0	0	0	F	F	F	T	2	NO
21859	242	920211	174433.94	40	47	0	21	33	0	F	F	F	T	2	NO
1589	242	920211	174634.25	60	87	30	29	75	0	F	F	F	T	1	NO
10826	241	920211	173319.96	20	58	30	16	50	0	F	F	F	F	1	NO
739	232	920211	085524.11	20	34	0	0	0	0	F	F	F	T	0	NO
10286	231	920211	103614.94	60	91	53	3	50	0	F	F	F	T	0	NO
10445	242	920210	230020.69	40	90	0	0	33	0	F	F	F	T	0	NO
3509	329	920121	101515.05	0	0	0	0	0	0	T	F	F	F	0	NO
10454	232	920211	100816.72	60	96	0	10	50	0	F	F	F	T	0	NO

SAT	SNSR	DATE	TIME	OBS	U	V	W	W>10	ID	FH	HALO	AGE	σ	RANK	EXPERT
15596	329	920211	043719.26	0	60	0	0	0	0	T	F	F	F	0	NO
2226	329	920211	195801.70	0	0	0	0	0	0	T	F	F	F	0	NO
2167	232	920211	091049.88	40	77	0	30	67	0	F	F	F	T	0	NO
21827	329	920210	233944.99	0	0	0	0	0	0	T	F	F	F	0	NO
21819	396	920211	061450.98	20	100	76	15	0	0	F	F	T	F	0	NO
11683	396	920124	123835.16	20	0	0	26	50	0	F	F	T	F	0	NO
21723	329	920211	023952.93	0	0	0	0	0	0	T	F	F	F	0	NO
10826	242	920211	173350.45	40	83	66	2	67	0	F	F	F	T	0	NO
19352	329	920211	023952.93	0	20	0	15	0	0	T	F	F	F	0	NO
2531	951	920211	085949.03	40	0	0	0	0	0	F	F	F	T	0	NO
12232	329	920211	003102.63	0	0	0	0	0	0	T	F	F	F	0	NO
19235	242	920211	174634.25	20	91	66	39	50	0	F	F	T	F	0	NO
5095	329	920211	212305.36	0	0	0	0	0	0	T	F	F	F	0	NO
12782	329	920211	075245.98	0	0	0	15	0	0	T	F	F	F	0	NO
3555	329	920211	002701.70	0	0	0	0	0	0	T	F	F	F	0	NO
4594	329	920211	064807.63	0	0	0	8	0	0	T	F	F	F	0	NO
702	231	920211	103934.11	100	26	0	0	33	0	F	F	F	T	0	NO
11	222	920211	120320.58	20	18	0	0	0	0	F	F	F	T	0	NO
20399	232	920211	060043.22	20	8	0	0	0	0	F	F	F	T	0	NO
11	398	920114	202056.60	20	0	0	0	0	0	F	F	T	F	0	NO
21141	398	920114	201849.91	40	91	0	0	33	0	F	F	T	F	0	NO
21277	329	920211	194454.98	0	44	0	0	0	0	T	F	F	F	0	NO
702	231	920211	103545.78	100	83	53	0	33	0	F	F	F	T	0	NO
19877	242	920210	230244.97	20	42	60	0	50	0	F	F	F	T	0	NO
87272	396	920120	015332.70	20	0	28	0	0	0	F	F	T	F	0	NO
12201	233	920211	094615.92	20	86	28	28	50	0	F	F	F	T	0	NO
3558	329	920211	201457.39	0	0	0	15	0	0	T	F	F	F	0	NO
4008	232	920211	052307.17	60	67	26	1	25	0	F	F	F	T	0	NO
9666	242	920211	174250.79	20	88	41	6	0	0	F	F	F	T	0	NO
9666	241	920211	174235.53	20	83	48	0	50	0	F	F	F	T	0	NO
9506	232	920211	073057.02	40	64	30	0	33	0	F	F	F	T	0	NO
4053	231	920211	103545.78	100	0	0	21	33	0	F	F	F	T	0	NO
9827	329	920211	035432.62	0	0	0	0	0	0	T	F	F	F	0	NO
9973	329	920211	003102.63	0	0	0	0	0	0	T	F	F	F	0	NO
560	399	920211	104520.79	20	64	0	29	50	0	F	F	F	T	0	NO
341	329	920211	003053.61	0	0	0	0	0	0	T	F	F	F	0	NO
179	329	920211	043719.26	0	0	0	0	0	0	T	F	F	F	0	NO
5350	329	920211	194610.19	0	0	0	0	0	0	T	F	F	F	0	NO
4698	329	920211	064807.63	0	0	0	15	0	0	T	F	F	F	0	NO
13907	242	920210	223123.74	40	0	0	0	0	0	F	F	F	T	0	NO
21567	396	920211	041032.30	20	0	0	24	50	0	F	F	F	T	0	NO
88632	232	920211	084039.55	20	0	0	3	0	0	F	F	T	F	0	NO
21777	334	920211	123620.44	40	0	0	0	0	0	F	F	F	T	0	NO
15935	329	920211	083930.42	0	24	0	8	0	0	T	F	F	F	0	NO
88732	329	920211	003625.05	0	0	0	0	0	0	T	F	F	F	0	NO
21723	329	920211	023536.23	0	60	0	8	0	0	T	F	F	F	0	NO
15836	222	920210	200459.89	20	0	0	0	0	0	F	F	F	T	0	NO
13907	242	920210	223358.66	40	43	0	0	0	0	F	F	F	T	0	NO
5446	329	920211	212322.30	0	0	0	0	0	0	T	F	F	F	0	NO
6306	399	920113	055423.13	20	73	0	0	0	0	F	F	T	T	0	NO
14136	398	920131	234103.31	20	0	0	0	50	0	F	F	T	F	0	NO
19185	232	920211	073057.02	60	70	0	0	0	0	F	F	F	T	0	NO
7126	242	920210	230431.24	40	88	7	0	33	0	F	F	F	T	0	NO
19235	241	920211	174633.88	20	90	64	0	50	0	F	F	T	F	0	NO
21360	329	920211	195801.70	0	0	0	8	0	0	T	F	F	F	0	NO
87360	329	920211	070828.20	0	0	0	15	0	0	T	F	F	F	0	NO
16527	232	920211	051620.84	100	54	0	0	33	0	F	F	F	T	0	NO
13112	221	920210	200504.94	80	0	0	0	0	0	F	F	F	T	0	NO
16106	369	920211	201133.77	20	29	0	0	0	0	F	F	F	T	0	NO
12165	221	920210	195115.32	20	97	44	2	50	0	F	F	F	T	0	NO
16268	221	920210	195250.54	20	95	63	5	50	0	F	F	F	T	0	NO
16527	232	920211	051456.85	20	38	0	0	0	0	F	F	F	T	0	NO
17189	329	920211	194610.19	0	80	0	0	0	0	T	F	F	F	0	NO
18518	329	920211	040254.32	0	0	0	0	0	0	T	F	F	F	0	NO

SAT	SNSR	DATE	TIME	OBS	U	V	W	W>10	ID	FH	HALO	AGE	σ	RANK	EXPERT
8542	396	920117	115443.05	40	0	0	37	67	0	F	F	T	F	0	NO
7218	329	920211	080948.96	0	0	0	15	0	0	T	F	F	F	0	NO
8127	393	920211	125447.90	20	5	0	0	0	0	F	F	F	T	0	NO
7855	396	920119	123502.89	20	59	0	15	50	0	F	F	T	F	0	NO
18277	393	920211	125447.90	20	0	0	0	0	0	F	F	F	T	0	NO
17628	329	920211	003102.63	0	0	0	8	0	0	T	F	F	F	0	NO
6779	232	920211	095352.86	40	91	0	0	0	0	F	F	F	T	0	NO
14624	221	920210	211804.49	40	80	25	42	67	0	F	F	F	T	0	NO
15562	398	920129	235638.11	40	0	0	0	33	0	F	F	T	F	0	NO
15378	398	920131	192504.28	40	32	0	32	67	0	F	F	T	F	0	NO
5013	329	920211	212305.36	0	0	0	0	0	0	T	F	F	F	0	NO
19690	398	920114	201939.79	20	59	12	0	0	0	F	F	T	F	0	NO
19576	399	920113	055312.35	80	0	0	14	0	0	F	F	T	T	0	NO
15680	242	920210	230946.67	40	21	0	0	33	0	F	F	F	T	0	NO
13562	396	920211	205738.71	20	62	0	19	50	0	F	F	F	T	0	NO
13554	242	920210	225947.88	60	15	0	0	0	0	F	F	F	T	0	NO
21538	329	920117	033604.77	40	0	0	71	100	100	T	F	T	T	0	NO
15680	242	920210	224108.97	60	0	0	0	50	0	F	F	F	T	0	NO
13554	242	920211	175641.24	100	0	0	0	0	0	F	F	F	T	0	NO
13798	232	920211	054001.99	20	73	80	40	50	0	F	F	T	F	0	NO
16137	396	920211	091108.41	40	4	0	0	0	0	F	F	F	T	0	NO
20123	399	920211	225715.81	40	37	0	0	0	0	F	F	F	T	0	NO
20127	241	920211	172857.63	60	0	0	0	25	0	F	F	F	T	0	NO
14618	241	920211	172857.63	60	83	0	12	50	0	F	F	F	T	0	NO
14590	242	920210	223358.66	40	0	0	0	0	0	F	F	F	T	0	NO
88028	232	920211	090056.60	60	0	0	0	25	0	F	F	T	T	0	NO
14978	242	920210	223358.66	40	38	0	0	33	0	F	F	F	T	0	NO
88794	231	920211	064813.17	40	93	35	0	33	0	F	F	F	T	0	NO
14783	242	920210	224923.21	60	46	0	43	75	0	F	F	F	T	0	NO
14356	232	920211	052037.05	20	31	0	10	50	0	F	F	F	T	0	NO
14483	329	920211	121911.27	0	0	0	0	0	0	T	F	F	F	0	NO
20488	398	920129	235511.74	20	0	31	0	0	0	F	F	T	F	0	NO
7004	399	920113	055312.35	20	76	0	2	0	0	F	F	T	F	0	NO
20742	399	920211	174937.89	20	19	0	0	0	0	F	F	F	T	0	NO
21150	231	920211	075734.75	60	71	56	51	75	0	F	F	F	T	0	NO
14496	232	920211	083016.70	20	43	0	63	100	0	F	F	F	T	0	NO
14514	393	920211	215722.80	60	0	0	61	75	0	F	F	F	T	0	NO

APPENDIX E. SOURCE CODE

Global data types and procedures used by several routines are included in the listing IO.H. Source code for the parser used to screen the OCR files is contained in the C code listing FILTER.C. The track building algorithm and evaluation function are also in C and are given in TRACKER.C and the modules that follow. Finally, the expert system rules are in the CLIPS code listing called EVALUATE.CLP.

```
/*****************************************************************************/
/*                                                                           */
/*  FILE:       IO.H                                                         */
/*  SYSTEM:     PC                                                           */
/*  COMPILER:   Borland ANSI C                                               */
/*  LAST MOD:   22 June 92                                                   */
/*  PURPOSE:    Contains global data types used by FILTER.C and TRACKER.C    */
/*              Also contains the I/O routines used by TRACKER.C             */
/*                                                                           */
/*****************************************************************************/
#include <STDIO.H>
#define TRUE 1
#define FALSE 0
#define MAX_OBS 110

/* GLOBAL TYPES */
  struct SAT_TYPE {
    char ID_SID[6];
    char INCLINATION[6];
    char PERIOD[8];
    char DRAG[8];
    char DESIG1[7];
    char DESIG2[7];
    char DESIG3[3];
    char RA[7];
    char ELSET_EPOCH[7];
  }; /* SAT_TYPE */

  struct OB_TYPE {
    char DATE[7];
    char TIME[10];
    char ALTITUDE[7];
    char U[7];
    char V[7];
    char W[7];
    char ID_SENSOR[6];
    char SENSOR[5];
  }; /* OB_TYPE */

struct STAT_TYPE {
  int JULIAN;
  int AGE;
  int OBS_IN_TRACK;
  float W_OVER_10;
  float POINTS;
  double DRAG;
  double PERIOD;
  double U_ave;
  double V_ave;
  double W_ave;
  double Ur;
  double Vr;
  double Wr;
  double U_sigma;
  double V_sigma;
  double W_sigma;
  int BAD_TRACK;
  int GOOD_TRACK;
  char ID_SENSOR[6];
  char ID_SID[6];
  char SENSOR[5];
}; /* STAT_TYPE */
```

```
struct FUZZY_TYPE {
  float W_OVER_10;
  float OBS_IN_TRACK;
  double DRAG;
  double Ur;
  double Vr;
  double Wr;
  int ID_MATCH;
  int BAD_TRACK;
  int GOOD_TRACK;
}; /* FUZZY_TYPE */

int OPENFILES(void);
/* Opens the global files IN, OUT, and STATS. Returns TRUE on success,
otherwise terminates the program */

int CLOSEFILES(void);
/* Closes all data files */

int GETSAT(char *S_STR, struct SAT_TYPE *S);
/* Reads a line from file IN, writes it to OUT, tokenizes it, and stores
results in variable pointed at by S. Returns 0 if blank line encountered,
1 if results successful, and terminates program on input error */

int PUTSAT(char *S_STR);
/* Writes the string S_STR to the file OUT. A simplistic routine included
for completeness */

int GETOBS(struct OB_TYPE OB[]);
/* Continually reads lines of data from file IN and stores results in array
OB. If successful, returns number of lines read. On array overflow, terminates
program. On input error, returns 0 */

int PUTOB(struct OB_TYPE OB);
/* Prints array OB to file OUT. Note that a new line character (\n) is
automatically inserted since it is part of token SENSOR */

int PUTTRACK(int ORDER[], struct OB_TYPE O[], int S, int F,
             struct FUZZY_TYPE DATA);
/* Writes the observations and statistical data for the track starting at
S and ending at F to the output file STATS */

int PUTRANK(int ORDER[], struct OB_TYPE O[], int S,
            struct STAT_TYPE DATA, struct FUZZY_TYPE, float RANK, char SAT[]);
/* Writes the rank, statistical data, track data, and satellite number
to output file TRACKS */
```

```
/****************************************************************************/
/*                                                                          */
/*  FILE:      FILTER.C                                                     */
/*  SYSTEM:    PC                                                           */
/*  COMPILER:  Borland ANSI C                                               */
/*  LAST MOD:  13 July 92                                                   */
/*  PURPOSE:   A simple parser for identifying errors produced by the OCR   */
/*             software used to scan in the SID report                      */
/*                                                                          */
/****************************************************************************/

#include <STDLIB.H>
#include <CTYPE.H>
#include <STRING.H>
#include "IO.H"

int REMOVE_BLANKS(char *STR)
/* Removes stray blanks left in data by OCR software. Also determines if STR
is an empty string, ie, a string with only blanks. Returns TRUE if lines is
a blank line */
{
  int i;
  int j = 1;
  int ISBLANK = TRUE;

  if (strlen(STR) >= 3) {

    for (i=1; STR[i+1] != NULL; i++) {
      if (!((STR[i-1] != ' ') && (STR[i+1] != ' ') && (STR[i] == ' '))) {
         /* Remove singleton blanks inserted by the OCR software */
         STR[j++] = STR[i];
          if (!(isspace(STR[i]))) {
           /*  Keep track of all blank lines */
           ISBLANK = FALSE;
         } /* if */
      }; /* if*/
    }; /* for */

    STR[j] = NULL;
  } /* if */

  return(ISBLANK);
}; /* REMOVE BLANKS */


int ISNUM_TOKEN(const char *TOKEN)
/* Returns true if TOKEN is a fixed or floating number */
{
  int i;
  int DECIMAL_OK = TRUE;

  for (i=0; TOKEN[i] != NULL; i++) {

    if (!(isdigit(TOKEN[i]) ||
        ((TOKEN[i] == '.') && DECIMAL_OK))) {
      return(FALSE);
    } /* if */

    DECIMAL_OK = DECIMAL_OK && (TOKEN[i] != '.');
  }; /* for */

  return(TRUE);
}; /* ISNUM_TOKEN */
```

```
int ISNEGNUM_TOKEN(const char *TOKEN)
/* Screens a token to ensure it is a positive or negative number */
{
  int i;
  int DECIMAL_OK = TRUE;

  for (i=0; TOKEN[i] != NULL; i++) {

    if (!(isdigit(TOKEN[i]) ||
        ((TOKEN[i] == '.') && DECIMAL_OK) ||
        ((TOKEN[i] == '-') &&  (i == 0)))) {
      return(FALSE);
    } /* if */

    DECIMAL_OK = DECIMAL_OK && (TOKEN[i] != '.');
  }; /* for */

  return(TRUE);
}; /* ISNEGNUM_TOKEN */


int ISTIME_TOKEN(const char *TOKEN)
/* Screens a token to ensure it is a time. Screens for HHMMSS form and
ignores fractions of seconds */
{
  int OK_TIME = TRUE;

  /* First ensure the token is at least a number and within range */
  OK_TIME = (ISNUM_TOKEN(TOKEN) && atol(TOKEN) < 245959);

  if (OK_TIME) {

    long int TIME;
    TIME = atol(TOKEN);

    /* Check that minutes are less than 60 */
    TIME = TIME - (TIME/10000)*10000;
    OK_TIME = OK_TIME && (TIME <= 5959);

    /* Check that seconds are less than 60 */
    TIME = TIME - (TIME/100)*100;
    OK_TIME = OK_TIME && (TIME <= 59);
  } /* if */

  return(OK_TIME);
}; /* ISTIME_TOKEN */
```

```
int ISDATE_TOKEN(const char *TOKEN)
/* Screens a token to ensure it is a date. Screens for YYMMDD format */
{
  int i;
  int OK_DATE = TRUE;

  /* First ensure the token is at least a number and within range */
  OK_DATE = (ISNUM_TOKEN(TOKEN) && atol(TOKEN) < 991231);
  if (OK_DATE) {
    long int DATE;
    DATE = atol(TOKEN);

    /* Check that month is less than or equal to 12 */
    DATE = DATE - (DATE/10000)*10000;
    OK_DATE = OK_DATE && (DATE <= 1231);

    /* Check that days are less than 31 */
    DATE = DATE - (DATE/100)*100;
    OK_DATE = OK_DATE && (DATE <= 31);
  } /* if */

  return(OK_DATE);
}; /* ISDATE_TOKEN */


int PARSE_AND_FORMAT_SAT(char *S_ID, char *S_STR, FILE *OUT, FILE *ERROR)
/* Screens S_STR, checks for OCR errors and prints
cleaned up data to the output file. Logs OCR errors in the error file.
Returns the satellite ID number in variable S */
{
  char *TOKEN;
  int BAD_TOKEN = FALSE;
  int i;

  /* First token is the satellite ID number */
  strcpy(S_ID, strtok(S_STR, " "));
  fprintf(OUT, "%5s", S_ID);

  if (!(ISNUM_TOKEN(S_ID)) || atol(TOKEN)>99999) {
    /* Token contains a misinterpreted character in satellite ID number */
    BAD_TOKEN = TRUE;
    fprintf(ERROR, "%s%s\n", S_ID, ": Bad satellite ID");
  } /* if */

  for (i=1; i<=8; i++) {
    /* Screen line for eight more tokens (total of nine so far) */

    if (TOKEN = strtok('\0', " ")) {
      /* Got a token */
      switch(i) {
        case 2: /* The period field. Should be less than 1700 minutes */
                  fprintf(OUT, "%9s", TOKEN);
                  if (!(ISNUM_TOKEN(TOKEN)) || atoi(TOKEN)>1700 ) {
                    /* Token contains a misinterpreted character from OCR */
                    BAD_TOKEN = TRUE;
                    fprintf(ERROR, "%s%s%i\n", S_ID,
                                    ": Bad token, satellite field ", i);
                  } /* if */
                  break;
      case 3: /* The drag field. Can be a negative number */
              fprintf(OUT, "%9s", TOKEN);
              if (!(ISNEGNUM_TOKEN(TOKEN)) || atof(TOKEN)>.5) {
                 /* Token contains a misinterpreted character from OCR */
                 BAD_TOKEN = TRUE;
                 fprintf(ERROR, "%s%s%i\n", S_ID,
                                ": Bad token, satellite field ", i);
               } /* if */
               break;

      case 4: /* First designation field */
              fprintf(OUT, "%4s", TOKEN);
              if (!(ISNUM_TOKEN(TOKEN))) {
                /* Token contains a misinterpreted character from OCR */
                BAD_TOKEN = TRUE;
                fprintf(ERROR, "%s%s\n", S_ID,
                               ": Bad token, satellite field 4");
              } /* if */
              break;

      case 5: /* Second designation field. Can be any alphanumeric */
              fprintf(OUT, "%4s", TOKEN);
              break;

      case 6: /* Third designation field. Any alphanumeric */
              fprintf(OUT, "%4s", TOKEN);
              break;

      case 8: /* Date field */
              fprintf(OUT, "%9s", TOKEN);
              if (!(ISDATE_TOKEN(TOKEN))) {
                BAD_TOKEN = TRUE;
                fprintf(ERROR, "%s%s%i\n", S_ID,
                               ": Bad token, satellite field ", i);
              } /* if */
              break;

      default: /* Fields 2 and 7 are angles */
               fprintf(OUT, "%9s", TOKEN);
               if (!(ISNUM_TOKEN(TOKEN)) || atoi(TOKEN)>360) {
                 /* Token contains a misinterpreted character from OCR */
                 BAD_TOKEN = TRUE;
                 fprintf(ERROR, "%s%s%i\n", S_ID,
                                ": Bad token, satellite field ", i);
               } /* if */
               break;

    } /* switch */

  } else {
    /* Was expecting a token, but could not find one */
    BAD_TOKEN = TRUE;
    fprintf(ERROR, "%s%s%i\n", S_ID, ": Ran out of tokens at ", i);
    break;
  }; /* if */

}; /* for */

/* Some lines my end with an ampersand */
if (TOKEN == strtok('\0', " ")) {
  fprintf(OUT, "%3s", TOKEN);

  if (!(TOKEN[0] == '*')) {
    BAD_TOKEN = TRUE;
    fprintf(ERROR, "%s%s%i\n", S_ID, ": Bad ampersand");
  } /* if */
} /* if */
```

```
  /* Finally, check for excess tokens */
  if (TOKEN = strtok('\0', " ")) {
    BAD_TOKEN = TRUE;
    fprintf(ERROR, "%s%s\n", S_ID, ": Too many tokens on satellite line");
  } /* if */

  fputc('\n', OUT);
  return(BAD_TOKEN);
} /* PARSE_AND_FORMAT_SAT */


int  PARSE_AND_FORMAT_OBS(char *S_ID, FILE *IN, FILE *OUT, FILE *ERROR)
/* Screens the observation data, checks for OCR errors and prints
cleaned up data to the output file. Logs OCR errors in the error file */
{
  char *TOKEN, OBS_STR[132];
  int BAD_TOKEN = FALSE;
  int i;

  for (; fgets(OBS_STR, 132, IN);) {
    /* Remove extraneous blanks and check for empty strings */
    if (!(REMOVE_BLANKS(OBS_STR))) {

      /* Tokenize the string if it isn't empty */
      TOKEN = strtok(OBS_STR, " ");

      for (i=1; i<=8; i++) {
        /* Screen line for eight tokens */
        if (TOKEN) {
          /* Got a token. First print it to the output file */

          if (i==1) {
            /* Print first token in extra wide field */
            fprintf(OUT, "%15s%c", TOKEN, ' ');
          } else {

            if (i==2) {
              /* Field 2 is the time field which does not include leading
              0's for times > 12:00. Add them to improve readability */
              fprintf(OUT, "%09.2f", atof(TOKEN));
            } else {
              fprintf(OUT, "%9s", TOKEN);
            } /* if */

          } /* if */

          /* Now check the token for errors from the OCR. */
          switch(i) {
            case 1: /* Date field */
                    if (!(ISDATE_TOKEN(TOKEN))) {
                      BAD_TOKEN = TRUE;
                      fprintf(ERROR, "%s%s%i\n", S_ID,
                                     ": Bad token, observation field ", i);
                    } /* if */
                    break;

              case 2: /* Time field */
                    if (!(ISTIME_TOKEN(TOKEN))) {
                      BAD_TOKEN = TRUE;
                      fprintf(ERROR, "%s%s%i\n", S_ID,
                                     ": Bad token, observation field ", i);
                    } /* if */
                    break;

              case 3: /* Altitude field */
                    if (!(ISNUM_TOKEN(TOKEN))) {
                      BAD_TOKEN = TRUE;
                      fprintf(ERROR, "%s%s%i\n", S_ID,
                                     ": Bad token, observation field ", i);
                    } /* if */
                    break;

              case 7: /* Sensor ID field. Value lies between 0 and 99999 */
                    if (!(ISNUM_TOKEN(TOKEN)) || atol(TOKEN)>99999) {
                      BAD_TOKEN = TRUE;
                      fprintf(ERROR, "%s%s%i\n", S_ID,
                                     ": Bad token, observation field ", i);
                    } /* if */
                    break;

              case 8: /* Sensor field. Value between 221 and 951 */
                    if (!(ISNUM_TOKEN(TOKEN)) || atoi(TOKEN) > 951 ||
                       atoi(TOKEN) < 221) {
                      BAD_TOKEN = TRUE;
                      fprintf(ERROR, "%s%s%i\n", S_ID,
                                     ": Bad token, observation field ", i);
                    } /* if */
                    break;

              default: /* The U,V,W errors can be negative or positive*/
                     if (!(ISNEGNUM_TOKEN(TOKEN))) {
                       BAD_TOKEN = TRUE;
                       fprintf(ERROR, "%s%s%i\n", S_ID,
                                      ": Bad token, observation field ", i);
                     } /* if */
                     break;
          } /* switch */

        } else {
          /* Was expecting a token, but could not find one */
          BAD_TOKEN = TRUE;
          fprintf(ERROR, "%s%s%i\n", S_ID,
                         ": Ran out of observation tokens at ", i);
          break;
        }; /* if */

        /* Get the next token */
        TOKEN = strtok('\0', " ");
      }; /* for */

      /* Finally, check for excess tokens */
      if (TOKEN) {
        BAD_TOKEN = TRUE;
        fprintf(ERROR, "%s%s\n", S_ID,
                       ": Too many tokens on observation line");
      } /* if */

      fprintf(OUT, "\n");

    } else {
      /* End when a blank line is encountered */
      fprintf(OUT, "\n");
      return(BAD_TOKEN);
    }; /* if */

  }; /* for */

  return(BAD_TOKEN);
}; /* PARSE_AND_FORMAT_OB */
```

```
int main(void)
{
  FILE *INFILE, *OUTFILE, *ERRORFILE;
  char SAT_STR[132], SAT_ID[6];
  char LAST_SAT[6] = "00000";
  int BAD_CHARS = FALSE;
  int END_OF_FILE = FALSE;

  /* open the input file */
  if ((INFILE = fopen("\OBS","rt")) == NULL) {
    printf("Error opening file OBS");
    exit(1);
  } /* if */

  /* open the output files */
  if ((OUTFILE = fopen("\CLEAN","wt")) == NULL){
    printf("Error opening file CLEAN");
    exit(1);
  }; /* if */

  /* Open the error file */
  if ((ERRORFILE = fopen("\ERRORS","wt")) == NULL){
    printf("Error opening file ERROR");
    exit(1);
  }; /* if */

  do  {
    /* Cycle past empty strings or comment strings (that begin with !) */
    do {
      END_OF_FILE = !(fgets(SAT_STR, 132, INFILE));
    } /* do */

    while ((REMOVE_BLANKS(SAT_STR) || SAT_STR[0]=='!') &&
            (!(END_OF_FILE)));

    if (!(END_OF_FILE)) {
      /* Parse, error check, and output the line of satellite data. */
      BAD_CHARS = BAD_CHARS +
                  PARSE_AND_FORMAT_SAT(SAT_ID, SAT_STR, OUTFILE, ERRORFILE);

      if (atol(LAST_SAT) > atol(SAT_ID)) {
        /* SAT_ID numbers should be in ascending order. If not, OCR made an
        error. Handle by interrupting program */
        printf("Satellite ID numbers out of order: %s  %s", LAST_SAT, SAT_ID);
        exit(1);
      } else {
        strcpy(LAST_SAT, SAT_ID);
      } /* if */

      /* Parse, error check, and output all lines of observation data */
      BAD_CHARS = BAD_CHARS +
                  PARSE_AND_FORMAT_OBS(SAT_ID, INFILE, OUTFILE, ERRORFILE);
    } /* if */

  } while (!(END_OF_FILE));

  if (BAD_CHARS) {
    /* Errors were found in the input data */
    printf("Bad tokens discovered. Results in file ERRORS\n");
    exit(1);
  } /* if */

  fclose(INFILE);
  fclose(OUTFILE);
  fclose(ERRORFILE);
  return(0);
}; /* MAIN */
```

```
/****************************************************************************/
/*                                                                          */
/*  FILE:     TRACKER.C                                                     */
/*  SYSTEM:   PC                                                            */
/*  COMPILER: Borland ANSI C                                                */
/*  LAST MOD: 22 June 92                                                    */
/*  PURPOSE:  Main program driver for the TRACKER program.                  */
/*            sorts the data, generates tracks from the observations,       */
/*            and computes various statistical data for parametric          */
/*            evaluations                                                   */
/*                                                                          */
/****************************************************************************/

#include <STDIO.H>
#include <STDLIB.H>
#include <STRING.H>
#include "IO.H"
#include "SORTER.H"
#include "STATS.H"
#include "EVALUATE.H"

int main(void)
{
  int i, NUMBER_OF_OBS;           /* Number of observations in the current track */
  struct OB_TYPE OBS[MAX_OBS];    /* The array of observations */
  int OB_ORDER[MAX_OBS];          /* Array for storing sorted order of obs */
  struct SAT_TYPE SAT;            /* The current satellite */
  char SAT_STR[81];               /* String of satellite data read from input file */
  int TOTAL_OBS = 0;              /* Count of the total number of obs in file */
  int TOTAL_TRACKS = 1;           /* Count of the total number of tracks */
  struct FUZZY_TYPE FUZZY_BUFFER; /* A buffer for storing fuzzy track parameters */
  struct FUZZY_TYPE *FUZZY_DATA;  /* Pointer to the fuzzy buffer */

  /* Clear the screen */
  for (i=0; i<80; i++) printf("\n");

  /* Open the data files */
  OPENFILES();

  /* Initialize buffer pointer for fuzzy data */
  FUZZY_DATA = &FUZZY_BUFFER;

  /* Get a satellite */
  printf("Satellite:  Obs in track:  Total obs:  Total tracks:\n");
  while (GETSAT(SAT_STR, &SAT)) {

    int START;                                              /* First observation in current track */
    int OLD_START;                                          /* First observation in previous track*/
    int OLD_FINISH;                                         /* Last observation in previous track */
    int FINISH = -1;                                        /* Last observation in current track */
    float RANK;                                             /* The ranking of the current track */
    struct STAT_TYPE STAT_BUFFER1, STAT_BUFFER2;            /* Buffers the current and last track */
    struct STAT_TYPE *TEMP_DATA, *OLD_DATA, *CURRENT_DATA;  /*Buffers the track's statistical datA*/

    /*Write the satellite data to the output file */
    PUTSAT(SAT_STR);

    /* For each satellite, read in the obs associated with it */
    NUMBER_OF_OBS = GETOBS(OBS);
    TOTAL_OBS = TOTAL_OBS + NUMBER_OF_OBS;
    if (NUMBER_OF_OBS) {
      printf("%7s%14i%14i%14i\r", SAT.ID_SID, NUMBER_OF_OBS,
                                  TOTAL_OBS, TOTAL_TRACKS);

      /* Sort the array of observations */
      SORT(NUMBER_OF_OBS, OB_ORDER, OBS);
    /* Put the first track in the buffer and initialize parameters */
    BUILDTRACK(NUMBER_OF_OBS, OB_ORDER, OBS, &START, &FINISH);
    OLD_START = START;
    OLD_FINISH = FINISH;
    OLD_DATA = &STAT_BUFFER1;
    CURRENT_DATA = &STAT_BUFFER2;

    /* Produce the stats for the first track */
    STATS(OB_ORDER, OBS, OLD_START, OLD_FINISH, SAT, OLD_DATA);

    while (FINISH < NUMBER_OF_OBS-1) {
      /* Build a track from a set of observations */
      BUILDTRACK(NUMBER_OF_OBS, OB_ORDER, OBS, &START, &FINISH);

      /* Compute the stats on each track */
      STATS(OB_ORDER, OBS, START, FINISH, SAT, CURRENT_DATA);

      /* Check to see if this track should be merged with the previous one.
      The algorithm here has a logic bug. If the current track SHOULD be
      merged with the following track, but CAN be merged with the previous,
      it will end up merged to the previous. Bug can be fixed with some
      effort, but for now will ignore it. */
      if (!(MERGE_TRACKS(OLD_DATA, CURRENT_DATA,
            OBS[OB_ORDER[OLD_FINISH]], OBS[OB_ORDER[START]]))) {

         /* Tracks did not merge. Write results to output file */
          FUZZY(OLD_DATA, FUZZY_DATA);
          PUTTRACK(OB_ORDER, OBS, OLD_START, OLD_FINISH, *FUZZY_DATA);

          /* Compute the rank of the track */
          RANK = EVALUATE((*FUZZY_DATA).OBS_IN_TRACK, (*FUZZY_DATA).W_OVER_10,
                          (*FUZZY_DATA).Ur, (*FUZZY_DATA).Vr,
                          (*FUZZY_DATA).Wr, (*FUZZY_DATA).ID_MATCH);

          /* Write the rank to the CLIPS input file */
          PUTRANK(OB_ORDER, OBS, OLD_START, *OLD_DATA, *FUZZY_DATA,
                  RANK, SAT.ID_SID);

          /* Copy the current data to the old data buffer by swapping
          pointers */
          TEMP_DATA = OLD_DATA;
          OLD_DATA = CURRENT_DATA;
          CURRENT_DATA = TEMP_DATA;
          OLD_START = START;
          TOTAL_TRACKS++;
      } /* if */

      OLD_FINISH = FINISH;
    } /* while */

    /* Output the last track left in LAST_TRACK */
    FUZZY(OLD_DATA, FUZZY_DATA);
    PUTTRACK(OB_ORDER, OBS, OLD_START, OLD_FINISH, *FUZZY_DATA);
    RANK = EVALUATE((*FUZZY_DATA).OBS_IN_TRACK, (*FUZZY_DATA).W_OVER_10,
                    (*FUZZY_DATA).Ur, (*FUZZY_DATA).Vr,
                    (*FUZZY_DATA).Wr, (*FUZZY_DATA).ID_MATCH);
    PUTRANK(OB_ORDER, OBS, OLD_START, *OLD_DATA, *FUZZY_DATA, RANK,
            SAT.ID_SID);
    TOTAL_TRACKS++;

  } else {
    /* Error occured reading the CLEAN file produced by FILTER routine */
    printf("\nError reading in clean observations for satellite %li",
            SAT.ID_SID);
    exit(0);
  } /* if */
  } /* while */

  CLOSEFILES();

  printf("\nProgram complete\n");
  return(TRUE);

} /* main */
```

```
/****************************************************************************/
/*                                                                          */
/*  FILE:      SORTER.C                                                     */
/*  SYSTEM:    PC                                                           */
/*  COMPILER:  Borland ANSI C                                               */
/*  LAST MOD:  22 June 92                                                   */
/*  PURPOSE:   Sorts an array of observation by sensor and epoch. The       */
/*             actual array is not modified; rather, the results of the     */
/*             sort is stored in a seperate array called ORDER.             */
/*                                                                          */
/****************************************************************************/

#include <STRING.H>
#include <STDLIB.H>
#include "IO.H"

char *NEWKEY(char *K, char *S, char *D)
{
  strcpy(K, S);
  strcat(K, D);
  return(K);
} /* NEWKEY */

int SORT(int N, int ORDER[], struct OB_TYPE O[])
/* This is an insertion sort routine with a time complexity of O(n^2). It
can be quite costly for large n, however, for smaller sorts it is simple and
quick. Elements are priority sorted by SENSOR, DATE, TIME. No error handling.
N is the number of elements in the array O. To prevent physical rewrites of
the file, a second array ORDER is actually used to return the sorted order
of O. Sorting is based on sensor first, date second. */
{
  int i, j, k;
  char KEY[11], TEMPKEY[11];

  for (i=0; i<N; i++) ORDER[i] = i;
  for (j=1; j < N; j++) {

    /* Select the jth element */
    NEWKEY(KEY, O[j].SENSOR, O[j].DATE);
    i = j-1;

    while (i >= 0 && strcmp(NEWKEY(TEMPKEY, O[ORDER[i]].SENSOR, O[ORDER[i]].DATE), KEY)>0) {
      /* Look for a place to insert the jth element */
      k = ORDER[i];
      ORDER[i] = ORDER[i+1];
      ORDER[i+1] = k;
      i--;
    } /* while */

  } /* for */

  return(TRUE);
} /* SORT */
```

```
/*****************************************************************************/
/*                                                                           */
/*  FILE:       STATS.C                                                      */
/*  SYSTEM:     PC                                                           */
/*  COMPILER:   Borland ANSI C                                               */
/*  LAST MOD:   15 Nov 922                                                   */
/*  PURPOSE:    Builds tracks from a list of observations, then computes     */
/*              statistical data about each track. Finally, determines       */
/*              the fuzzy set membership of the features used by the         */
/*              evaluation function                                          */
/*                                                                           */
/*****************************************************************************/

#include <STDIO.H>
#include <STDLIB.H>
#include <STRING.H>
#include <MATH.H>
#include "IO.H"

int JULIAN(char DATE[])
/* Computes the equivalent julian date for the variable DATE */
{
  int J[] = {0, 0, 31, 59, 90, 120, 151, 181, 212, 243, 273, 304, 334, 365};
  char MONTH[3] = "  ";
  char DAY[3] = "  ";

  MONTH[0] = DATE[2];
  MONTH[1] = DATE[3];
  DAY[0] = DATE[4];
  DAY[1] = DATE[5];
  return(J[atoi(MONTH)]+ atoi(DAY));
}; /* JULIAN */

long int E_TIME(char D2[], char T2[], char D1[], char T1[])
/* Computes elapsed time between S2 and S1. Format is HHMMSS.SS. Returns
error if time passes through midnight */
{
  long int TIME1, TIME2;
  long int DELTA = 0;

  TIME1 = atol(T1);
  TIME2 = atol(T2);
  if (strcmp(D1, D2) != 0) {
    /* Dates are not the same. Must subtract dates to find true delta */
    long int JULIAN[] = {0, 0, 31, 59, 90, 120, 151, 181, 212, 243, 273, 304, 334, 365};
    long int DATE1, DATE2;

    DATE1 = atol(D1);
    DATE2 = atol(D2);

    /* Convert years to seconds */
    DELTA = ((DATE2/10000)-(DATE1/10000))*365*24*60*60;
    DATE1 = DATE1 - (DATE1/10000)*10000;
    DATE2 = DATE2 - (DATE2/10000)*10000;

    /* Convert months to seconds */
    DELTA = DELTA + (JULIAN[DATE2/100] - JULIAN[DATE1/100])*24*60*60;
    DATE1 = DATE1 - (DATE1/100)*100;
    DATE2 = DATE2 - (DATE2/100)*100;

    /* Finally convert days to seconds */
    DELTA = DELTA + (DATE2 - DATE1)*24*60*60;
  } /* if */
  /* Convert hours to seconds */
  DELTA = DELTA + ((TIME2/10000)-(TIME1/10000))*60*60;
  TIME1 = TIME1 - (TIME1/10000)*10000;
  TIME2 = TIME2 - (TIME2/10000)*10000;

  /* Convert minutes to seconds */
  DELTA = DELTA + ((TIME2/100)-(TIME1/100))*60;
  TIME1 = TIME1 - (TIME1/100)*100;
  TIME2 = TIME2 - (TIME2/100)*100;

  /* Finally add seconds */
  DELTA = DELTA + TIME2 - TIME1;

  return(DELTA);
} /* E-TIME */


int BUILDTRACK(int N, int ORDER[], struct OB_TYPE O[], int *S, int *F)
/* Given the array O sorted according to array ORDER with N elements,
the starting and ending point for a track is determined and returned in
the pointers S and F */
{
  char *SENSOR;
  long int i,             /* Used for loop control */
           TRACK_DEL_T,   /* The average time between obs for the current track */
           DEL_T;         /* The time between the current two obs being examined */
  long int MAX_T = 180;   /* Longest delta t between obs allowed in a track.
                             Set to 180 in a test with sat #88931 */
  long int MIN_T =  45;   /* Delta T below which obs will automatically be
                             put into the same track. Origonally at 20 sec,
                             I reset to 45 since NAVSPASUR considers tracks
                             within one minute of each other the same track */
  float TOLERANCE = .65;  /* Tolerance limits how much variation is allowed
                             between successive points in a track. Set to
                             .60 to accommodate SAT 770. Reset to .65 to
                             accomadate SAT 88931 */
  char ID_TRACK[7];       /* Satellite number that sensor origonally assigned
                             this observations to */

  (*S) = ++(*F);
  SENSOR = O[ORDER[(*S)]].SENSOR;

  if ((*S) < N-1)
    /* This is a crummy bug fix to handle the last track of a satellite
    that has only one observation. Although BUILDTRACK can handle this
    situation, E_TIME cannot because it chokes on negative delta t's */
    TRACK_DEL_T = E_TIME(O[ORDER[(*S)+1]].DATE, O[ORDER[(*S)+1]].TIME,
                         O[ORDER[(*S)]].DATE, O[ORDER[(*S)]].TIME);
    strcpy(ID_TRACK, O[ORDER[(*S)]].ID_SENSOR);

  for (i=(*S); i+1<N; i++) {
    /* This loop builds tracks of one or more observations. Obs
    are added to the track until one fails to meet the following
    criteria:
      - Ob came from same sensor as rest of obs in track
      - Ob was originally tagged to the same satellite as track
      - The delta t between this ob and the previous one
        is consistent with prior delta t's for this track
      - The delta t is not greater than a maximum given by MAX_T  */
    if (strcmp(O[ORDER[i+1]].ID_SENSOR, ID_TRACK) == 0 ||
     (atol(O[ORDER[i+1]].ID_SENSOR)>=90000 && atol(ID_TRACK)>= 90000)) {
      /* If the original satellite ID's assigned by the sensor match,
      proceed to compute the delta t. If not, end the track. Must be
      done this way to prevent DEL_T from choking on a negative
      result. Note that an ID of 90000 or greater are all unknowns and
      can be mixed on the same track */
      DEL_T = E_TIME(O[ORDER[i+1]].DATE, O[ORDER[i+1]].TIME,
                     O[ORDER[i]].DATE, O[ORDER[i]].TIME);

      if (DEL_T < MAX_T &&
         ((DEL_T <= (1+TOLERANCE)*TRACK_DEL_T) || (DEL_T<MIN_T)) &&
         ((DEL_T >= (1-TOLERANCE)*TRACK_DEL_T) || (DEL_T<MIN_T))  &&
         strcmp(O[ORDER[i+1]].SENSOR, SENSOR) == 0) {
        /* If delta t between the two observations is within limits
        and if the same sensor made both observations, proceed*/

/* Following temporarily commented out. System seems to work OK without
   this rule
        if (i+2 < N &&
            (strcmp(O[ORDER[i+2]].ID_SENSOR, ID_TRACK) == 0 ||
            (atol(O[ORDER[i+1]].ID_SENSOR)>=90000 && atol(ID_TRACK)>= 90000)) &&
            strcmp(O[ORDER[i+2]].SENSOR, SENSOR) == 0 &&
            E_TIME(O[ORDER[i+2]], O[ORDER[i+1]]) < .5*TRACK_DEL_T) {
          /* This handles the special case where one track ends and
          another from the same sensor starts. The observation marked
          by i+1 belongs to the second track if it has a smaller
          delta t with that track. Truthfully, I doubt this rule
          ever fires */
/*          break;
        } /* if */

      } else {
         break;
      } /* if */
    } else {
      break;
    } /* if */

  } /* for */

  (*F) = i;
  return(TRUE);
} /* BUILDTRACK */


double ERROR_BETWEEN_TRACKS(double ERROR1, double ERROR2, double OFFSET) {
/* Computes the difference between ERROR1 and ERROR2 then divides by their
average. OFFSET is used in the divisor to scale error values near zero */
  double ERROR;

  ERROR = (ERROR1-ERROR2)/(ERROR1+ERROR2+OFFSET);
  if (ERROR > 1) return(ERROR);
  return(ERROR);
} /* ERROR_BETWEEN_TRACKS */


double NEW_RMS(double RMS1, double RMS2, int POINTS1, int POINTS2) {
/* Given two rms error values, calculates the composite rms value */
  return(sqrt((RMS1*RMS1*POINTS1+RMS2*RMS2*POINTS2)/(POINTS1+POINTS2)));
}; /* NEW_RMS */


double NEW_AVE(double AVE1, double AVE2, int POINTS1, int POINTS2) {
/* Given two averages, computes the composite average */
  return((AVE1*POINTS1+AVE2*POINTS2)/(POINTS1+POINTS2));
}; /* NEW_AVE */
```

```
double DEVIATION(double RMS, double AVE, int POINTS) {
/* Given the RMS and average values for a series of numbers with POINTS
elements, computes the standard deviation */
  if (POINTS == 1) {
    return(0);
  } /* if */
  return(sqrt((RMS*RMS - AVE*AVE)*POINTS/(POINTS-1)));
}; /* DEVIATION */


int MERGE_TRACKS(struct STAT_TYPE *PREVIOUS, struct STAT_TYPE *CURRENT,
                 struct OB_TYPE OB1, struct OB_TYPE OB2) {
/* Examines the statistical data in PREVIOUS and CURRENT to determine
if the two tracks should be merged. Returns TRUE if they were merged with
data in PREVIOUS modified to reflect the new combined track  */

  if (((*PREVIOUS).OBS_IN_TRACK <= 2 || (*CURRENT).OBS_IN_TRACK <= 2) &&
      (strcmp((*PREVIOUS).SENSOR, (*CURRENT).SENSOR) == 0) &&
      (strcmp((*PREVIOUS).ID_SENSOR, (*CURRENT).ID_SENSOR) == 0) &&
      E_TIME(OB2.DATE, OB2.TIME, OB1.DATE, OB1.TIME) < 900) {
      /* Combine short tracks of two or fewer points that are within 15 min
      of each other. Must come from same sensor and have same tag field */

     double U_ERROR, V_ERROR, W_ERROR;
     U_ERROR = ERROR_BETWEEN_TRACKS((*PREVIOUS).Ur, (*CURRENT).Ur, 10.0);
     V_ERROR = ERROR_BETWEEN_TRACKS((*PREVIOUS).Vr, (*CURRENT).Vr, 10.0);
     W_ERROR = ERROR_BETWEEN_TRACKS((*PREVIOUS).Wr, (*CURRENT).Wr, 2.0);
     if (U_ERROR+V_ERROR+W_ERROR < 0.5) {
       /* Error is small enough to justify merging the tracks */

       /* compute new RMS values*/
       (*PREVIOUS).Ur = NEW_RMS((*PREVIOUS).Ur, (*CURRENT).Ur,
                                (*PREVIOUS).OBS_IN_TRACK,
                                (*CURRENT).OBS_IN_TRACK);
       (*PREVIOUS).Vr = NEW_RMS((*PREVIOUS).Vr, (*CURRENT).Vr,
                                (*PREVIOUS).OBS_IN_TRACK,
                                (*CURRENT).OBS_IN_TRACK);
       (*PREVIOUS).Wr = NEW_RMS((*PREVIOUS).Wr, (*CURRENT).Wr,
                                (*PREVIOUS).OBS_IN_TRACK,
                                (*CURRENT).OBS_IN_TRACK);

       /* Compute the new averages */
       (*PREVIOUS).U_ave = NEW_AVE((*PREVIOUS).U_ave, (*CURRENT).U_ave,
                                (*PREVIOUS).OBS_IN_TRACK,
                                (*CURRENT).OBS_IN_TRACK);
       (*PREVIOUS).V_ave = NEW_AVE((*PREVIOUS).V_ave, (*CURRENT).V_ave,
                                (*PREVIOUS).OBS_IN_TRACK,
                                (*CURRENT).OBS_IN_TRACK);
       (*PREVIOUS).W_ave = NEW_AVE((*PREVIOUS).W_ave, (*CURRENT).W_ave,
                                (*PREVIOUS).OBS_IN_TRACK,
                                (*CURRENT).OBS_IN_TRACK);

       (*PREVIOUS).OBS_IN_TRACK = (*PREVIOUS).OBS_IN_TRACK +
                                (*CURRENT).OBS_IN_TRACK;

       (*PREVIOUS).W_OVER_10 = (*PREVIOUS).W_OVER_10 + (*CURRENT).W_OVER_10;

       /* Compute new standard deviations */
       (*PREVIOUS).U_sigma = DEVIATION((*PREVIOUS).Ur,
                                     (*PREVIOUS).U_ave,
                                     (*PREVIOUS).OBS_IN_TRACK);
       (*PREVIOUS).V_sigma = DEVIATION((*PREVIOUS).Vr,
                                     (*PREVIOUS).V_ave,
                                     (*PREVIOUS).OBS_IN_TRACK);
       (*PREVIOUS).W_sigma = DEVIATION((*PREVIOUS).Wr,
                                     (*PREVIOUS).W_ave,
                                     (*PREVIOUS).OBS_IN_TRACK);
       return(TRUE);
     } /* if */
   } /* if */

   return(FALSE);
}; /* MERGE_TRACKS */


int LOOKUP_GOOD_TRACKS(char *S, char *D, char *T, char *E)
/* A look up table of tracks that the orbital analyst judged as being
good. Specific data is from 14 Feb 92. Returns TRUE for good tracks, FALSE
otherwise */
{
  /* The matrix of good tracks sorted by satellite number, date, time */
  int SIZE = 150;
  int n = 0;
  char KEY[28];

                                  /* SAT  DATE   TIME      SENSOR */
  char GOOD_TRACKS[][27]  =  {
                 "100 920211 061511.19 221",
                 "101 920211 061511.19 221",
                 "102 920211 061511.19 221",
                 "103 920211 061511.19 221",
                 "104 920211 061511.19 221",
                 "105 920211 061511.19 221",
                 "106 920211 061511.19 221",
                 "107 920211 061511.19 221",
                 "108 920211 061511.19 221",
  /* F.H. */    "2865 920211 041558.43 369",
  /* F.H. */    "3899 920116 052633.12 396",
  /* F. H. */   "4637 920211 061511.19 396",
                "7324 920210 223733.02 242",
                "8513 920210 224108.97 242",
  /* F.H. */    "8547 920211 165652.54 334",
  /* F.H. */   "10617 920211 182910.50 396",
  /* F.H. */   "11332 920211 091102.01 396",
  /* F.H. */   "13464 920211 065548.75 396",
               "14362 920211 020456.34 396",
               "14362 920211 124613.90 399",
               "14783 920210 223052.30 242",
               "14783 920210 223358.66 242",
               "15390 920203 094258.60 398",
               "15390 920204 143150.82 398",
               "15390 920204 220712.12 398",
               "15390 920205 025047.47 398",
               "15390 920205 120903.59 398",
               "15390 920206 050941.81 398",
               "15390 920206 094834.08 398",
               "15390 920206 142622.62 398",
               "15390 920207 072808.50 398",
               "15390 920207 072904.82 398",
               "15390 920207 072943.26 398",
               "15390 920207 120331.15 398",
               "15390 920208 050436.75 398",
               "15390 920208 094258.60 398",
               "15390 920208 215222.16 398",
               "15390 920209 023657.23 398",
               "15390 920209 072238.54 398",
               "15390 920209 115754.19 398",
               "15390 920209 120409.88 398",
               "15390 920209 120544.80 398",
               "15390 920210 045915.51 398",
               "15390 920210 093716.01 398",
  /* F.H. */   "15758 920211 104746.33 396",
  /* F.H. */   "17253 920114 103256.76 334",
  /* F.H. */   "17253 920114 105051.82 334",
                "18601 920211 051519.34 399",
    /* F.H. */  "18955 920211 065624.74 396",
    /* F.H. */  "19111 920211 195216.51 396",
    /* F.H. */  "19437 920211 064921.49 396",
                "19994 920201 222215.38 399",
                "19994 920203 220516.73 399",
                "19994 920204 215559.39 399",
                "19994 920205 214636.98 399",
                "20171 920211 090347.41 385",
                "20171 920211 090645.29 385",
                "20596 920211 113638.66 385",
                "20596 920211 113849.79 382",
                "20672 920201 114236.23 398",
                "20946 920211 085933.98 951",
                "20947 920211 080512.09 399",
                "21058 920211 060621.80 399",
                "21223 920211 144226.11 383",
  /* F.H. */    "21538 920207 071500.69 334",
                "21692 920114 201731.99 398",
                "21764 920211 002941.04 329",
  /* F.H. */    "21854 920211 022437.88 369",
  /* F.H. */    "21854 920211 030327.21 369",
  /* F.H. */    "21854 920211 030916.93 369",
  /* F.H. */    "21854 920211 035325.95 369",
  /* F.H. */    "21854 920211 041331.80 404",
  /* F.H. */    "21854 920211 050100.73 369",
                "21854 920211 174937.89 399",
                "21855 920211 023724.93 369",
                "21855 920211 052003.77 369",
                "21855 920211 021948.96 399",
                "21855 920211 023045.83 399",
                "21855 920211 023942.32 399",
                "87117 920211 000946.59 399",
                "87117 920211 104520.79 399",
                "87117 920211 104551.42 399",
                "87117 920211 141607.67 399",
                "87153 920211 175600.24 396",
                "87153 920211 041108.28 399",
  /* F.H. */    "87272 920211 194016.37 396",
  /* F.H. */    "87302 920120 125531.79 396",
  /* F.H. */    "87302 920121 021310.78 396",
  /* F.H. */    "87302 920122 023430.37 396",
  /* F.H. */    "87302 920122 120013.03 396",
  /* F.H. */    "87302 920124 123825.29 396",
                "87332 920211 125447.90 393",
                "87336 920211 095954.57 396",
                "87356 920211 130900.40 393",
                "87365 920211 100130.79 396",
                "87373 920211 061147.69 396",
                "87376 920211 182446.10 393",
                "87869 920211 012726.24 396",
                "87869 920211 220531.05 399",
                "88032 920131 233733.43 398",
                "88048 920127 004924.94 398",
                "88048 920130 013501.19 398",
                "88072 920202 124621.80 398",
                "88075 920210 235311.23 399",
                "88079 920204 110819.68 398",
                "88079 920205 130417.49 398",
                "88079 920205 183534.10 398",
                "88079 920206 145927.72 398",
                "88079 920207 112808.80 398",
                "88079 920207 165639.68 398",
                "88079 920208 132305.70 398",
                "88079 920209 095244.27 398",
                "88079 920209 151846.06 398",
                "88079 920210 114604.06 398",
              "88079 920211 134139.59 398",
              "88079 920214 150321.55 398",
              "88079 920211 145927.72 398",
              "88079 920211 080906.00 399",
              "88079 920211 134139.59 399",
              "88079 920211 134324.21 399",
              "88108 920210 211716.37 221",
              "88108 920211 185826.02 243",
              "88112 920211 141612.28 221",
              "88114 920211 144608.40 221",
              "88117 920211 064649.66 231",
              "88120 920211 104534.61 399",
              "88446 920211 135416.12 399",
/* F.H. */    "88629 920211 123620.44 334",
/* F.H. */    "88769 920211 124356.87 334",
              "88788 920129 235105.84 398",
              "88788 920131 052028.33 398",
              "88788 920201 003122.15 398",
              "88838 920211 092047.21 232",
              "88850 920211 025439.64 383",
/* F.H. */    "88856 920211 000143.45 399",
              "88892 920126 220010.21 398",
              "88892 920128 232902.17 398",
              "88892 920206 213722.87 398",
              "88893 920119 025118.25 398",
              "88893 920121 012227.11 398",
              "88893 920123 042117.61 398",
              "88893 920123 042305.72 398",
              "88893 920124 012108.74 398",
              "88893 920127 011746.77 398",
              "88893 920127 031818.20 398",
              "88917 920202 020730.47 398",
              "88917 920202 020649.86 399",
              "88917 920211 223247.69 385",
              "88917 920211 223258.96 399",
              "88931 920211 201906.84 383"
           /* "00000 YYMMDD 000000.00 000", */ };

  /* Build the search key */
  strcpy(KEY,S);
  strcat(KEY," ");
  strcat(KEY, D);
  strcat(KEY," ");
  strcat(KEY, T);
  strcat(KEY," ");
  strcat(KEY, E);
  /* Clip off the new line character that comes with the E field */
  KEY[strlen(KEY)-1] = '\0';

  /* Conduct search */
  while ((n<SIZE) && (strcmp(GOOD_TRACKS[n], KEY) != 0)) n++;

  /* See if match was found */
  if ((n< SIZE) && (strcmp(GOOD_TRACKS[n], KEY) == 0))
   return(TRUE);

  /* If no match, return false */
  return(FALSE);
} /* LOOKUP_GOOD_TRACKS */
```

```
int STATS(int ORDER[], struct OB_TYPE O[], int S, int F,
          struct SAT_TYPE SAT, struct STAT_TYPE *DATA)
/* Computes the statistical data for a track given by the elements of O
starting at S and ending at F inclusive. */
{
  int i;
  struct OB_TYPE CUR_OB;

  /* Initialize cumulative fields */
  (*DATA).W_OVER_10 = 0.0;
  (*DATA).Ur = 0.0;
  (*DATA).Vr = 0.0;
  (*DATA).Wr = 0.0;
  (*DATA).U_ave = 0;
  (*DATA).V_ave = 0;
  (*DATA).W_ave = 0;

  for (i=S; i <= F; i++) {

    /* Add up cumulitive fields */
    CUR_OB = O[ORDER[i]];

    if (abs(atoi(CUR_OB.W)) >= 10) {
      (*DATA).W_OVER_10 = (*DATA).W_OVER_10+1.0;
    } /* if */

    (*DATA).Ur = (*DATA).Ur + pow(atol(CUR_OB.U), 2);
    (*DATA).Vr = (*DATA).Vr + pow(atol(CUR_OB.V), 2);
    (*DATA).Wr = (*DATA).Wr + pow(atol(CUR_OB.W), 2);
    (*DATA).U_ave = (*DATA).U_ave + atol(CUR_OB.U);
    (*DATA).V_ave = (*DATA).V_ave + atol(CUR_OB.V);
    (*DATA).W_ave = (*DATA).W_ave + atol(CUR_OB.W);
  } /* for */

  /* Compute number of obs in track */
  (*DATA).OBS_IN_TRACK = (F-S+1);

  /* Compute the averages */
  (*DATA).U_ave = (*DATA).U_ave/(*DATA).OBS_IN_TRACK;
  (*DATA).V_ave = (*DATA).V_ave/(*DATA).OBS_IN_TRACK;
  (*DATA).W_ave = (*DATA).W_ave/(*DATA).OBS_IN_TRACK;

  /* Compute the rms values for the errors */
  (*DATA).Ur = sqrt((*DATA).Ur/(*DATA).OBS_IN_TRACK);
  (*DATA).Vr = sqrt((*DATA).Vr/(*DATA).OBS_IN_TRACK);
  (*DATA).Wr = sqrt((*DATA).Wr/(*DATA).OBS_IN_TRACK);

  /* Compute the standard deviations */
  (*DATA).U_sigma = DEVIATION((*DATA).Ur, (*DATA).U_ave, (*DATA).OBS_IN_TRACK);
  (*DATA).V_sigma = DEVIATION((*DATA).Vr, (*DATA).V_ave, (*DATA).OBS_IN_TRACK);
  (*DATA).W_sigma = DEVIATION((*DATA).Wr, (*DATA).W_ave, (*DATA).OBS_IN_TRACK);

  /* Copy the drag */
  (*DATA).DRAG = atof(SAT.DRAG);

  /* Copy the period */
  (*DATA).PERIOD = atof(SAT.PERIOD);

  /* Look up the experts opinion on whether a track is good or not */
  (*DATA).GOOD_TRACK = LOOKUP_GOOD_TRACKS(SAT.ID_SID,
                                          O[ORDER[S]].DATE,
                                          O[ORDER[S]].TIME,
                                          O[ORDER[S]].SENSOR);
  (*DATA).BAD_TRACK = (!(*DATA).GOOD_TRACK);
  /* Compute the julian date of the track and it's age compared to the
  elset epoch */
  (*DATA).JULIAN = JULIAN(O[ORDER[S]].DATE);
  (*DATA).AGE = E_TIME(O[ORDER[S]].DATE, O[ORDER[S]].TIME,
                       SAT.ELSET_EPOCH, "235959.99")/86400;

  /* Finally, record the SENSOR, ID_SENSOR, and ID_SID fields for possible
  use by the COMPARE_TRACKS routine */
  strcpy((*DATA).SENSOR, O[ORDER[S]].SENSOR);
  strcpy((*DATA).ID_SENSOR, O[ORDER[S]].ID_SENSOR);
  strcpy((*DATA).ID_SID, SAT.ID_SID);

  return(TRUE);
} /* STATS */


int FUZZY(struct STAT_TYPE *DATA, struct FUZZY_TYPE *F)
/* Maps selected data from SAT and DATA into fuzzy sets for use by the
evaluator function. All mappings have a range from 0 to 1 indicating degree
of set membership */
{
  float RMS;

  /* Number of obs in each track. Membership criteria: This track has lots
  of obs. */
  if ((*DATA).OBS_IN_TRACK > 6) {
    (*F).OBS_IN_TRACK = 1.0;
  } else {
    (*F).OBS_IN_TRACK = ((*DATA).OBS_IN_TRACK-1)/5.0;
  } /* if */

  /* Drag. Membership criteria: This satellite is experiencing high drag */
  (*F).DRAG = (*DATA).DRAG;

  if ((*F).DRAG < 0.0) {
    (*F).DRAG = 1.0 + log10(-(*F).DRAG)/4.0;
    if ((*F).DRAG > 1.0) {
      /* Satellite drag is greater than -1.0000. Set to 1.0000 */
      (*F).DRAG = 1.0;
    }; /* if */
  } else {
    /* Satellite has positive or no drag. Set to same as .0001 drag */
    (*F).DRAG = 0.00;
  } /* if */
```

```
/* RMS errors for the U, V, W axis. Membership criteria: This error is
small. Use seperate rules for scaling the error for single point
and multi-point tracks */
if ((*DATA).OBS_IN_TRACK == 1) {

  /* Clip and scale the 1 ob tracks values*/
  if ((*DATA).Ur > 25.0) {
    (*F).Ur = 0.0;
  } else {
    (*F).Ur = 1.0 - (*DATA).Ur/25.0;
  } /* if */

  if ((*DATA).Vr > 30.0) {
     (*F).Vr = 0.0;
  } else {
     (*F).Vr = 1.0 - (*DATA).Vr/30.0;
  } /* if */

  if ((*DATA).Wr > 13.0) {
     (*F).Wr = 0.0;
  } else {
     (*F).Wr = 1.0 - (*DATA).Wr/13.0;
  } /* if */

} else {
  /* For multi-point tracks, scale RMS values for U and V by satellite
  period and drag */
  (*F).Ur = (*DATA).Ur*pow((*DATA).PERIOD, -.500);
  (*F).Vr = (*DATA).Vr*pow((*DATA).PERIOD, -.500);
  (*F).Wr = (*DATA).Wr;

  /* Scale the errors by DRAG. Higher drag yields greater error tolerance */
  if ((*F).DRAG > .25) {
    (*F).Ur = (*F).Ur/(1+0.8*(*F).DRAG);
    (*F).Vr = (*F).Vr/(1+1.0*(*F).DRAG);
    (*F).Wr = (*F).Wr/(1+0.4*(*F).DRAG);
  } /* if */

  /* Clip and scale the RMS values*/
  if ((*F).Ur > 15.0) {
     (*F).Ur = 0.0;
  } else {
     (*F).Ur = 1.0 - (*F).Ur/15.0;
  } /* if */

  if ((*F).Vr > 30.0) {
     (*F).Vr = 0.0;
  } else {
     (*F).Vr = 1.0 - (*F).Vr/30.0;
  } /* if */

  if ((*F).Wr > 13.0) {
     (*F).Wr = 0.0;
  } else {
     (*F).Wr = 1.0 - (*F).Wr/13.0;
  } /* if */
} /* if */

/* W>10. Membership criteria: This track has few W errors greater than 10 */
(*F).W_OVER_10 = 1.0 - (*DATA).W_OVER_10/(*DATA).OBS_IN_TRACK;

/* ID. Membership criteria: Origonal sensor tag is the same as current
satellite */
(*F).ID_MATCH = !(strcmp((*DATA).ID_SID, (*DATA).ID_SENSOR));

/* Copy the good and bad track data from the expert */
(*F).GOOD_TRACK = (*DATA).GOOD_TRACK;
```

```
  (*F).BAD_TRACK = (*DATA).BAD_TRACK;

  return(TRUE);
} /* FUZZY */

} /* STATS */
```

```
/*****************************************************************************/
/*                                                                           */
/*  FILE:       IO.C                                                         */
/*  SYSTEM:     PC                                                           */
/*  COMPILER:   Borland ANSI C                                               */
/*  LAST MOD:   22 June 92                                                   */
/*  PURPOSE:    Input/output routines. Only one of the output files is       */
/*              actually used by CLIPS, the TRACKS file. Others are produced */
/*              for debugging purposes                                       */
/*                                                                           */
/*****************************************************************************/

#include <STRING.H>
#include <STDLIB.H>
#include <MATH.H>
#include "IO.H"
#include "EVALUATE.H"

/* Global file names */
FILE *IN, *OUT, *STATSFILE, *TRACKSFILE;

int OPENFILES(void)
/* Opens the global files IN, OUT, and STATS. Returns TRUE on success,
otherwise terminates the program */
{
  /* open the input file */
  if ((IN = fopen("\CLEAN","rt")) == NULL) {
    printf("Error opening file CLEAN");
    exit(1);
  } /* if */

  /* open the debugging output file */
  if ((OUT = fopen("\SORTED","wt")) == NULL){
    printf("Error opening file SORTED");
    exit(1);
  }; /* if */

  /* open the debugging statistics files */
  if ((STATSFILE = fopen("\STATS","wt")) == NULL){
    printf("Error opening file STATS");
    exit(1);
  }; /* if */

  /* open the results files for CLIPS*/
  if ((TRACKSFILE = fopen("\TRACKS","wt")) == NULL){
    printf("Error opening file RESULTS");
    exit(1);
  }; /* if */

  return(1);
} /* OPENFILES */


int CLOSEFILES(void)
/* Closes all data files */
{
  fclose(IN);
  fclose(OUT);
  fclose(STATSFILE);

  return(1);
} /* CLOSEFILES */
```

```
int GETSAT(char *SAT_STR, struct SAT_TYPE *S)
/* Reads a line from file IN, writes it to OUT, tokenizes it, and stores
results in variable pointed at by S. Returns 0 if blank line encountered,
1 if results successful, and terminates program on input error */
{
  int ERROR = FALSE;
  char S_STR[81];

  /* Read in a line */
  if (strlen(fgets(S_STR, 80, IN)) > 1) {

    strcpy(SAT_STR, S_STR);
    /* Tokenize the string if it is not empty (ie, length < 1) */
    strcpy((*S).ID_SID, strtok(S_STR, " ")); ERROR = ERROR + !((*S).ID_SID);
    strcpy((*S).INCLINATION,strtok('\0'," "));ERROR=ERROR+!((*S).INCLINATION);
    strcpy((*S).PERIOD , strtok('\0', " ")); ERROR = ERROR + !((*S).PERIOD);
    strcpy((*S).DRAG, strtok('\0', " ")); ERROR = ERROR + !((*S).DRAG);
    strcpy((*S).DESIG1, strtok('\0', " ")); ERROR = ERROR + !((*S).DESIG1);
    strcpy((*S).DESIG2, strtok('\0', " ")); ERROR = ERROR + !((*S).DESIG2);
    strcpy((*S).DESIG3, strtok('\0', " ")); ERROR = ERROR + !((*S).DESIG3);
    strcpy((*S).RA , strtok('\0', " ")); ERROR = ERROR + !((*S).RA);
    strcpy((*S).ELSET_EPOCH,strtok('\0'," "));ERROR=ERROR+!((*S).ELSET_EPOCH);

    if (ERROR) {
      printf("Error while reading clean satellite data, satellite %li\n",
              (*S).ID_SID);
      exit(0);
    } /* if */

  } else {
    /* Must be end of file */
    return(0);

  } /* if */

  /* Process successful */
  return(1);
} /* GETSAT */

int PUTSAT(char *S_STR)
/* Writes the string S_STR to the file OUT and STATSFILE. Returns non-negitive
number on success, else returns a value equal to EOF */
{
  fprintf(STATSFILE, "\n");
  fputs("!", STATSFILE);
  fputs(S_STR, STATSFILE);
  return(fputs(S_STR, OUT));
} /* PUTSAT */



int GETOBS(struct OB_TYPE OB[])
/* Continually reads lines of data from file IN and stores results in array
OB. If successful, returns number of lines read. On array overflow, terminates
program. On input error, returns 0 */
{
  char OBS_STR[81];
  int ERROR = FALSE;
  int i = 0;

  while (strlen(fgets(OBS_STR, 81, IN)) > 1) {
    /* Tokenize the string if it isn't empty (ie, it has length > 1) */
    strcpy(OB[i].DATE, strtok(OBS_STR, " ")); ERROR = ERROR + !(OB[i].DATE);
    strcpy(OB[i].TIME, strtok('\0', " ")); ERROR = ERROR + !(OB[i].TIME);
    strcpy(OB[i].ALTITUDE,strtok('\0', " "));ERROR=ERROR+!(OB[i].ALTITUDE);
    strcpy(OB[i].U, strtok('\0', " ")); ERROR = ERROR + !(OB[i].U);
    strcpy(OB[i].V, strtok('\0', " ")); ERROR = ERROR + !(OB[i].V);
    strcpy(OB[i].W, strtok('\0', " ")); ERROR = ERROR + !(OB[i].W);
    strcpy(OB[i].ID_SENSOR, strtok('\0', " "));ERROR=ERROR+!(OB[i].ID_SENSOR);
    strcpy(OB[i].SENSOR, strtok('\0', " ")); ERROR = ERROR + !(OB[i].SENSOR);

    if (++i >= MAX_OBS) {
      printf("Array overflow while reading in clean observation data");
      exit(0);
    } /* if */

  }; /* while */

  if (ERROR) {
    return(0);
  } else {
    return(i);
  } /* if */

} /* GETOBS */


int PUTOB(struct OB_TYPE OB)
/* Prints OB to file OUT. Note that a new line character (\n) is
 automatically inserted since it is part of token SENSOR. */
{
  fprintf( OUT, "%15s", OB.DATE);
  fprintf( OUT, "%11s", OB.TIME);
  fprintf( OUT, "%7s", OB.ALTITUDE);
  fprintf( OUT, "%8s", OB.U);
  fprintf( OUT, "%8s", OB.V);
  fprintf( OUT, "%8s", OB.W);
  fprintf( OUT, "%7s", OB.ID_SENSOR);
  fprintf( OUT, "%5s", OB.SENSOR);
  return(0);
} /* PUTOB */

int PUTSTATS(FILE *FNAME, struct FUZZY_TYPE DATA) {
/* Writes the information stored in DATA to specified file FNAME*/

  fprintf(FNAME, "%11.2f", DATA.OBS_IN_TRACK);
  fprintf(FNAME, "%5.2f", DATA.W_OVER_10);
  fprintf(FNAME, "%8.2f", DATA.DRAG);
  fprintf(FNAME, "%16.2f", DATA.Ur);
  fprintf(FNAME, "%7.2f", DATA.Vr);
  fprintf(FNAME, "%7.2f", DATA.Wr);
  fprintf(FNAME, "%3i", DATA.ID_MATCH);
  fprintf(FNAME, "%3i", DATA.GOOD_TRACK);
  fprintf(FNAME, "%3i\n", DATA.BAD_TRACK);

  return(1);
} /* PUTSTATS */

int PUTRANK(int ORDER[], struct OB_TYPE O[], int S,
            struct STAT_TYPE DATA, struct FUZZY_TYPE FDATA, float RANK,
            char SAT[])
/* Writes the rank, statistical data, track data, and satellite number
to output file TRACKS. Percentages are used so that CLIPS only has to
handle integers, not floats */
{
  char SENSOR[4] = "";
  char HOUR[3] = "";

  strncat(SENSOR, O[ORDER[S]].SENSOR, 3);
  strncat(HOUR, O[ORDER[S]].TIME, 2);

  fprintf(TRACKSFILE, "(track (satellite \"%5s\")", SAT);
  fprintf(TRACKSFILE, "(sensor %s)", SENSOR);
  fprintf(TRACKSFILE, "(id_sensor \"%5s\")", DATA.ID_SENSOR);
  fprintf(TRACKSFILE, "(epoch \"%s %s\")", O[ORDER[S]].DATE, O[ORDER[S]].TIME);
  fprintf(TRACKSFILE, "(julian %i)", DATA.JULIAN);
  fprintf(TRACKSFILE, "(age %3i)", DATA.AGE);
  fprintf(TRACKSFILE, "(hour %s)", HOUR);
  fprintf(TRACKSFILE, "(points %3.0f)", 100*FDATA.OBS_IN_TRACK);
  fprintf(TRACKSFILE, "(u %3.0f)", 100*FDATA.Ur);
  fprintf(TRACKSFILE, "(v %3.0f)", 100*FDATA.Vr);
  fprintf(TRACKSFILE, "(w %3.0f)", 100*FDATA.Wr);
  fprintf(TRACKSFILE, "(u_sigma %3.0f)", DATA.U_sigma/10);
  fprintf(TRACKSFILE, "(v_sigma %3.0f)", DATA.V_sigma/10);
  fprintf(TRACKSFILE, "(w_sigma %3.0f)", DATA.W_sigma/10);
  fprintf(TRACKSFILE, "(w>10 %3.0f)", 100*FDATA.W_OVER_10);
  fprintf(TRACKSFILE, "(id %3i)", 100*FDATA.ID_MATCH);
  fprintf(TRACKSFILE, "(rank %3.0f)", 100*RANK);

  if (FDATA.GOOD_TRACK) {
    /* Expert thought this was a good track */
    fprintf(TRACKSFILE, "(expert %3s))\n", "YES");
  } else {
    fprintf(TRACKSFILE, "(expert %3s))\n", "NO");
  } /* if */

  return(1);
} /* PUTRANK */


int PUTTRACK(int ORDER[], struct OB_TYPE O[], int S, int F,
             struct FUZZY_TYPE DATA)
/* Writes the observations and statistical data for the track starting at
S and ending at F to the output file for use by CLIPS */
{
  int i;

  for (i=S; i<=F; i++) {
    PUTOB(O[ORDER[i]]);
  } /* for */

  /* Write the statistical data to both the OUT and STATSFILE files */
  PUTSTATS(OUT, DATA);
  PUTSTATS(STATSFILE, DATA);
  fprintf(OUT, "\n");

  return(1);
} /* PUTTRACK */
```

```
/*****************************************************************************/
/*                                                                           */
/*  FILE:      EVALUATE.C                                                    */
/*  SYSTEM:    PC                                                            */
/*  COMPILER:  Borland ANSI C                                                */
/*  LAST MOD:  21 Nov 92                                                     */
/*  PURPOSE:   Computes the rank of a given track using fuzzy set theory.   */
/*             Rank is based on evaluation function that uses a feature     */
/*             set that has been mapped to the range (0,1) using            */
/*             fuzzy set memberships                                        */
/*****************************************************************************/
#include <STDLIB.H>
#include <STDIO.H>
#include <MATH.H>


float EVALUATE(float POINTS,
             float W_OVER_10,
             double Ur,
             double Vr,
             double Wr,
             int ID_MATCH
) {
/* Performs a fuzzy logic evaluation of a track by examining how well it
fits the characteristics of the two types of tracks: those that should be
accepted and those that should be rejected. ACCEPT and REJECT are the set
membership functions. In there present form they produce values from 0 to
1.943; scaling could map them to 0 to 1 values, but here that scaling is
handled in the RANK calculations. RANK is based on the difference between
the two membership functions. That delta can have a range from d_min to
d_max. The actual delta is divided by the maximum to get a rank from 0 to 1.
This rank represents the possibility that the given track is a good one */
  float ACCEPT, REJECT;
  float d_min = -.748;
  float d_max =  .647;

  ACCEPT = sqrt(pow((.6411-POINTS),2) + pow((1.0214-W_OVER_10),2) +
                pow((.8364-Ur),2) + pow((.7368-Vr),2) +
                pow((.8866-Wr),2) + pow((.4603-ID_MATCH),2));

  REJECT = sqrt(pow((.3118-POINTS),2) + pow((0.6962-W_OVER_10),2) +
                pow((.6942-Ur),2) + pow((.4871-Vr),2) +
                pow((.4636-Wr),2) + pow((.1754-ID_MATCH),2));

  return((REJECT-ACCEPT-d_min)/(d_max-d_min));
} /* EVALUATE */
```

```
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
; TITLE:    EVALUATE.CLP                                                       ;
; AUTHOR:   Mike Hecker                                                        ;
; DATE:     23 Sep 92                                                          ;
; PURPOSE:  An expert system that catagorizes satellite tracks                 ;
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;

(deftemplate track
     (field satellite   (type            STRING))
     (field sensor      (type            INTEGER))
     (field id_sensor   (type            STRING))
     (field epoch       (type            STRING))
     (field julian      (type            INTEGER))
     (field age         (type            INTEGER))
     (field hour        (type            INTEGER))
     (field points      (type            INTEGER))
     (field u           (type            INTEGER))
     (field v           (type            INTEGER))
     (field w           (type            INTEGER))
     (field u_sigma     (type            INTEGER))
     (field v_sigma     (type            INTEGER))
     (field w_sigma     (type            INTEGER))
     (field w>10        (type            INTEGER))
     (field id          (type            INTEGER))
     (field rank        (type            INTEGER))
     (field expert      (type            SYMBOL)
                        (allowed-symbols YES NO))
     (field fh          (type            SYMBOL)
                        (allowed-symbols T F)
                        (default         F))
     (field old_epoch   (type            SYMBOL)
                        (allowed-symbols T F)
                        (default         F))
     (field sigma       (type            SYMBOL)
                        (allowed-symbols T F)
                        (default         F))
     (field halo        (type            SYMBOL)
                        (allowed-symbols T F)
                        (default         F))
) ;DEFTEMPLATE TRACK

(deftemplate sensor
     (field id_number   (type            INTEGER))
     (field reliability (type            SYMBOL)
                        (allowed-symbols GOOD BAD))
); DEFTEMPLATE SENSOR

(deftemplate flags
     (field front_half  (type            SYMBOL)
                        (allowed-symbols T F)
                        (default         F))
     (field bad_sensor  (type            SYMBOL)
                        (allowed-symbols T F)
                        (default         F))
     (field old_epoch   (type            SYMBOL)
                        (allowed-symbols T F)
                        (default         F))
     (field sigma       (type            SYMBOL)
                        (allowed-symbols T F)
                        (default         F))
     (field halo        (type            SYMBOL)
                        (allowed-symbols T F)
                        (default         F))
     (field print       (type            SYMBOL)
                        (allowed-symbols T F)
                        (default         F))
);flags
```

```
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;                             INITIAL FACTS                                    ;
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;

(deffacts sensors
     ;Similar facts determine which sensors are from the same ground facility.
     ;They are asserted as pairs here. A more elogent and general solution
     ;would use multi-value fields
     (sensor (id_number 334) (reliability GOOD))
     (sensor (id_number 369) (reliability GOOD))
     (sensor (id_number 396) (reliability GOOD))
     (sensor (id_number 404) (reliability GOOD))
     (sensor (id_number 329) (reliability BAD))
     (similar 241 241)
     (similar 242 242)
     (similar 243 243)
     (similar 398 398)
     (similar 399 399)
     (similar 243 242)
     (similar 241 242)
     (similar 242 241)
     (similar 242 243)
     (similar 243 242)
     (similar 241 243)
     (similar 243 241)
     (similar 399 398)
     (similar 398 399)
);sensors

(deffacts globals
     (flags)
);globals

;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;                         FUNCTIONS AND SYSTEM RULES                           ;
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;

(deffunction approximately_equal (?A ?B ?TOLERANCE)
    ;Returns true if A is within TOLERANCE percent of B
    (and (< ?A (* ?B (+ 1 ?TOLERANCE))) (> ?A (* ?B (- 1 ?TOLERANCE))))
); approximately_equal

(deffunction unknown (?ID)
    ;Returns true if ?ID is an unknown observation, ie, a tag > 90000
    (and (eq (str-length ?ID) 5) (> (str-compare ?ID "90000") 0) )
); unknown

(defrule load_stats
    (declare (salience 1000))
    (initial-fact)
   ?FLAGS <- (flags (bad_sensor F))
    =>
    (load-facts tracks)
    (modify ?FLAGS (bad_sensor T))
);load_stats

(defrule activate_old_epoch
   ;This rule suppresses firing of the old_epoch rule until all bad_sensor rules
   ;are off the agenda. Controls memory usage and enhances speed
   (declare (salience 805))
   ?FLAGS <- (flags (old_epoch F))
   ->
   (modify ?FLAGS (old_epoch T))
);activate_old_epoch
```

```
(defrule activate_too_much_variation
   ;This rule suppresses firing of the too_much_variation rule until all higher salience rules
   ;are off the agenda. Controls memory usage and enhances speed
   (declare (salience 855))
   ?FLAGS <- (flags (sigma F))
   ->
   (modify ?FLAGS (sigma T))
);activate_old_epoch

(defrule activate_halo
   ;This rule suppresses firing of the rule until all higher salience rules
   ;are off the agenda. Controls memory usage and enhances speed
   (declare (salience 705))
   ?FLAGS <- (flags (halo F))
   ->
   (modify ?FLAGS (halo T))
);activate_halo

(defrule activate_front_half
   ;This rule suppresses firing of the front_half rule until all old_epoch rules
   ;are off the agenda. Controls memory usage and enhances speed
   (declare (salience 605))
   ?FLAGS <- (flags (front_half F))
   ->
   (modify ?FLAGS (front_half T))
);activate_front_half

(defrule activate_print
   ;This rule suppresses firing of the printing rules until all old_epoch rules
   ;are off the agenda. Controls memory usage and enhances speed
   (declare (salience 25))
   ?FLAGS <- (flags (print F))
   ->
   (modify ?FLAGS (print T))
);activate_printing

(defrule print_header
    (declare (salience 20))
    (flags (print T))
    =>
    (open "RANKING" r "w")
    (printout r "SAT    SNSR DATE    TIME       OBS   U    V    W W>10 FH HALO AGE SIG  ID RANK
EXPERT" crlf)
);print_header

(defrule print_ranking
    (declare (salience 10))
    (flags (print T))
    ?F <- (track (rank ?RANK_HIGHEST)(satellite ?SAT)(sensor ?SENSOR)(epoch ?EPOCH)
                 (points ?P)(u ?U)(v ?V)(w ?W)(w>10 ?W>10)(id ?ID)(expert ?E)
                 (old_epoch ?A)(fh ?FH)(halo ?HALO)(sigma ?SIGMA))
    (not (track (rank ?RANK&:(> ?RANK ?RANK_HIGHEST))))
    (not (track (rank ?R&:(eq ?R ?RANK_HIGHEST))(satellite ?S&:(< (str-compare ?S ?SAT) 0))))
    =>
    (format r "%-6s %-4d %-16s %4d %4d %4d %4d %4d %2s %4s %3s %3s %3d %4d %6s"
              ?SAT ?SENSOR ?EPOCH ?P  ?U  ?V  ?W  ?W>10 ?FH ?HALO ?A ?SIGMA  ?ID ?RANK_HIGHEST ?E)
    (printout r crlf)
    (retract ?F)
);print_ranking

(defrule quit
    (declare (salience 0))
    (not (track))
    =>
    (close)
);quit
```

```
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;                               EVALUATION  RULES                                   ;
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;

(defrule bad_sensor
   (declare (salience 900))
   ;Reduce rankings for tracks from unreliable sensors. The amount of reduction is 10% here,
  ;but that number needs to be verified. Not enough data available to date to really test it
   (flags (bad_sensor T))
   (sensor (reliability ?RELIABLE&:(eq ?RELIABLE BAD))(id_number ?S_BAD))
   ?F <- (track (sensor ?S&:(eq ?S ?S_BAD))(fh ?FH&:(eq ?FH F))(rank ?R))
   =>
   (bind ?R (max (- ?R 10) 0))
   (modify ?F (rank ?R)(fh T))
);bad_sensor

(defrule too_much_variation
   ;Reduces ranking for tracks with u or v errors that vary too much. Variance is measured
   ;through standard deviation recorded in fields u_sigma and v_sigma.
   (declare (salience 850))
   (flags (sigma T))
   ?F <- (track (u_sigma ?U) (v_sigma ?V) (sigma ?S&:(eq ?S F)) (rank ?R))
   (test (or (> ?V 10) (> ?U 10)))
   =>
   (bind ?DELTA (max (* (- ?U 10) 5) (* (- ?V 10) 5)) )
   (bind ?DELTA (min ?DELTA 30))
   (bind ?R (max (- ?R ?DELTA) 0))
   (modify ?F (rank ?R) (sigma T))
);too_much_variation

(defrule old_epoch
   ;Reduces or improves ranking for tracks whose epoch is older/younger than the epoch of
   ;the elset. Formula is to change for every day past 2 days old for a maximum of 26%
   ;change
   (declare (salience 800))
   (flags (old_epoch T))
   ?F <- (track (age ?AGE&:(> (abs ?AGE) 2)) (points ?P&:(neq ?P 0)) (old_epoch ?E&:(eq ?E F))
                (rank ?R))
   =>
   (bind ?DELTA (min (* (- (abs ?AGE) 2) 6) 26))
   (if (< ?AGE 0) then
     (bind ?R (max (- ?R ?DELTA) 0))
   else
     (bind ?R (min (+ ?R ?DELTA) 99))
   );if
   (modify ?F (rank ?R)(old_epoch T))
);old_epoch

(defrule halo-short_track
   (declare (salience 700))
   ;Advance rankings for 1-2 point tracks that are close in time to good tracks. Ranking of
   ;short track is set equal to longer if
   ;    - Obs came from same sensor
   ;    - The longer track has at least 3 points
   ;    - The u, v, w errors are approximately the same
   ;    - The tracks are within an hour of each other. This should be refined as better
   ;      epoch data is passed to CLIPS from C code routines
   ?FLAGS <- (flags (halo T))
   ?F <- (track (points ?P&:(< ?P 21))(julian ?J)(satellite ?SAT)(sensor ?S)(rank ?R)
                (hour ?H) (w ?W) )
   (track (satellite ?SAT2&:(eq ?SAT2 ?SAT))(sensor ?S2&:(eq ?S2 ?S))(points ?P2&:(> ?P2 20))
          (hour ?H2&:(< (abs (- ?H2 ?H)) 1))(julian ?J2&:(eq ?J2 ?J))(rank ?R2&:(> ?R2 ?R))
          (w ?W2&:(approximately_equal ?W ?W2 .10)) )
   (not (track (julian ?J)(satellite ?SAT)(sensor ?S)(rank ?R3&:(> ?R3 ?R2))))
   =>
   (modify ?F (rank ?R2)(halo T))
);halo-short_track
```

```
(defrule halo-single_point_track
   (declare (salience 700))
   ;Advance rankings for 1 point tracks that are similar to good tracks. Ranking of
   ;short track is set equal to longer if
   ;     - Obs came from the same or similar sensors
   ;     - The longer track has at least 3 points
   ;     - The origonal tags from the sensor match or original tag was unknown
   ;       (SENSOR_ID is the same or equal to 9XXXX)
   ;     - The w errors are approximately the same
   ;When selecting the better track, the one closest in time (age is about the same)
   ;to the shorter track is selected. This rule has a weakness in that the "not"
   ;construct requires sensor 3 (?S3) to be equal to sensor 1 (?S) rather than just
   ;similar. Problem arises from the not which does not allow conditionals as
   ;arguements. Solution is to use forward chaining to assert relevent facts about
   ;similar sensors and tracks, operate on those facts, then retract the facts
   ;when complete. For now, this implementation is incomplete but adequate
   ?FLAGS <- (flags (halo T))
   ?F <- (track (points ?P&:(eq ?P 0))(satellite ?SAT)(sensor ?S)(rank ?R)
                (w ?W) (id_sensor ?ID) (julian ?J) )
   (track (satellite ?SAT2&:(eq ?SAT2 ?SAT)) (sensor ?S2) (points ?P2&:(> ?P2 20))
          (rank ?R2&:(> ?R2 ?R)) (w ?W2&:(approximately_equal ?W ?W2 .20))
          (id_sensor ?ID2) (julian ?J2) )
   (similar ?S ?S2)
   (test ( or (eq ?ID ?ID2) (unknown ?ID) (unknown ?ID2) ))
   (not (track (satellite ?SAT) (sensor ?S3&:(eq ?S3 ?S)) (rank ?R3&:(> ?R3 ?R))
                    (julian ?J3&:(< (abs (- ?J ?J3)) (abs (- ?J ?J2)) )) ))
   =>
   (modify ?F (rank ?R2)(halo T))
);halo-single_point_track

(defrule halo-similar_tracks_different_sensors
   (declare (salience 700))
   ;Advance rankings for tracks that are similar but from different sensors. Rankings
   ;advanced if
   ;     - Tracks belong to the same satellite
   ;     - One of the tracks has a ranking of at least 60%
   ;     - The worst track considered has a rank of at least 45%
   ;     - The shortest track considered has at least 3 observations
   ;The amount that the ranking improves is based on the total number of tracks involved and
   ;varies from 2% to 5%
   ?FLAGS <- (flags (halo T))
   ?F <- (track (points ?P&:(> ?P 20)) (satellite ?SAT) (rank ?R&:(> ?R 44)) )
   (track (satellite ?SAT2&:(eq ?SAT2 ?SAT)) (points ?P2&:(> ?P2 59))
          (rank ?R2&:(> ?R2 44)) )
   =>
   (assert (similar_tracks ?F))
);halo-similar_tracks_different_sensors

(defrule front_half
   (declare (salience 600))
   ;Advance rankings for tracks from reliable sensors that also have a good ID
   ?FLAGS <- (flags (front_half T))
   ?F <- (track (id ?ID&:(eq ?ID 100))(fh ?FH&:(eq ?FH F))(rank ?R)(sensor ?S))
   (sensor (id_number ?S_GOOD&:(eq ?S_GOOD ?S))(reliability ?RELIABLE&:(eq ?RELIABLE GOOD)))
   =>
   (modify ?F (rank 100)(fh T))
);front_half
```

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